

A N
E P I T O M E
O F
NAVIGATION:

CONTAINING

The Doctrin of *Plain & Spherical Triangles*,
and their Use and Application in *Plain*
Sailing, *Mercator's Sailing*, and *Great*
Circle Sailing, as also in *Astronomy* and
Geography, and Rules for finding the *Variation*
of the *Compass*, and correcting the *Course*.

TOGETHER WITH

Tables of the Sun and Stars *Right Ascension* and
Declination, Of the *Latitude* and *Longitude* of Places,
Of *Meridional Parts*. Likewise a *Traverse-Table*,
A *Perpetual Almanack*, and other things
very useful in the Art of *Navigation*.

A N D

The *Logarithm Sines* and *Tangents*, with the
Logarithms of *Natural Numbers* from 1 to 10:0, care-
fully corrected according to those exact Tables for-
merly set forth.

By HENRY GELLIBRAND,
Late Professor of Astronomy in Gresham-College.

LONDON: Printed by Andr. Clark for William Fisher, and are
to be sold at his Shop at the Postern near Tower-Hill. 1674.

8^o 8.7. Art.



A Table of Diff. of Latitude and Departure.

Distance	3 $\frac{1}{4}$ Point.				3 $\frac{1}{2}$ Point.				3 $\frac{3}{4}$ Point.				4 Points.				Distance
	Lat.		Dep.		Lat.		Dep.		Lat.		Dep.		Lat.		Dep.		
1	0	8	0	6	0	8	0	6	0	7	0	7	0	7	0	7	1
2	1	6	1	2	1	6	1	3	1	5	1	3	1	4	1	4	2
3	2	4	1	8	2	3	1	9	2	2	2	0	2	1	2	1	3
4	3	2	2	4	3	1	2	5	3	0	2	7	2	8	2	8	4
5	4	0	3	0	3	9	3	2	3	7	3	4	3	5	3	5	5
6	4	8	3	6	4	6	3	8	4	4	4	0	4	2	4	2	6
7	5	6	4	2	5	4	4	4	5	2	4	7	4	9	4	9	7
8	6	4	4	8	6	2	5	1	5	9	5	4	5	7	5	7	8
9	7	2	5	4	7	0	5	7	6	7	6	0	6	4	6	4	9
10	8	0	6	0	7	7	6	3	7	4	6	7	7	1	7	1	10
11	8	8	6	6	8	5	6	9	8	1	7	4	7	8	7	8	11
12	9	6	7	2	9	2	7	5	8	9	8	0	8	5	8	5	12
13	10	4	7	8	10	0	8	2	9	6	8	7	9	2	9	2	13
14	11	2	8	4	10	8	8	8	10	4	9	4	9	9	9	9	14
15	12	0	9	0	11	6	9	4	11	1	10	0	10	6	10	6	15
16	12	8	9	6	12	4	10	1	11	9	10	7	11	3	11	3	16
17	13	6	10	2	13	2	10	7	12	6	11	4	12	0	12	0	17
18	14	4	10	8	14	0	11	3	13	4	12	0	12	7	12	7	18
19	15	2	11	4	14	7	12	0	14	1	12	7	13	4	13	4	19
20	16	1	11	9	15	5	12	7	14	8	13	4	14	1	14	1	20
21	16	9	12	5	16	3	13	3	15	6	14	1	14	8	14	8	21
22	17	7	13	1	17	1	13	9	16	3	14	8	15	6	15	6	22
23	18	5	13	7	17	9	14	6	17	1	15	5	16	3	16	3	23
24	19	3	14	3	18	6	15	3	17	8	16	1	17	0	17	0	24
25	20	1	14	9	19	4	15	9	18	6	16	8	17	7	17	7	25
26	20	9	15	5	20	2	16	6	19	3	17	5	18	4	18	4	26
27	21	7	16	1	21	0	17	2	20	1	18	1	19	1	19	1	27
28	22	5	16	7	21	7	17	8	20	7	18	8	19	8	19	8	28
29	23	3	17	3	22	5	18	4	21	5	19	5	20	5	20	5	29
30	24	1	17	9	23	2	19	0	22	2	20	1	21	2	21	2	30
	Dep.		Lat.		Dep.		Lat.		Dep.		Lat.		Dep.		Lat.		
	4 $\frac{1}{4}$ Point.		4 $\frac{1}{2}$ Point		4 $\frac{3}{4}$ Point.		4 Points.		4 $\frac{1}{4}$ Point.		4 $\frac{1}{2}$ Point		4 $\frac{3}{4}$ Point.		4 Points.		

A Table of Diff. of Latitude and Departure.													
Distance	2 $\frac{1}{4}$ Point.			2 $\frac{1}{2}$ Point.			2 $\frac{3}{4}$ Point.			3 Points.			Distance
	Lat.	Dep.		Lat.	Dep.		Lat.	Dep.		Lat.	Dep.		
31	28 0	13 3		27 4	14 5		26 6	15 9		25 7	17 2		31
32	28 9	13 7		28 2	15 0		27 4	16 4		26 5	17 8		32
33	29 8	14 1		29 1	15 5		28 3	16 9		27 3	18 3		33
34	30 7	14 6		30 0	15 9		29 1	17 4		28 2	18 9		34
35	31 6	15 0		30 9	16 4		30 0	17 9		29 1	19 4		35
36	32 5	15 4		31 8	16 9		30 9	18 5		29 9	20 0		36
37	33 4	15 8		32 6	17 4		31 7	19 0		30 8	20 6		37
38	34 3	16 3		33 5	17 9		32 6	19 5		31 6	21 1		38
39	35 2	16 7		34 4	18 4		33 4	20 1		32 4	21 7		39
40	36 1	17 1		35 3	18 9		34 3	20 6		33 3	22 2		40
41	37 0	17 6		36 2	19 3		35 1	21 1		34 1	22 8		41
42	37 9	18 0		37 1	19 8		36 0	21 6		34 9	23 3		42
43	38 8	18 4		38 0	20 3		36 9	22 1		35 8	23 9		43
44	39 7	18 9		38 8	20 8		37 7	22 6		36 6	24 4		44
45	40 6	19 3		39 7	21 2		38 6	23 1		37 4	25 0		45
46	41 6	19 7		40 6	21 7		39 4	23 6		38 3	25 6		46
47	42 5	20 1		41 5	22 2		40 3	24 2		39 1	26 1		47
48	43 4	20 6		42 4	22 7		41 1	24 7		39 9	26 7		48
49	44 3	21 0		43 2	23 2		42 0	25 2		40 8	27 2		49
50	45 2	21 4		44 1	23 6		42 9	25 7		41 6	27 8		50
51	46 1	21 8		45 0	24 1		43 7	26 2		42 4	28 3		51
52	47 0	22 3		45 9	24 5		44 6	26 7		43 3	28 9		52
53	47 9	22 7		46 8	24 9		45 4	27 2		44 1	29 4		53
54	48 8	23 1		47 7	25 4		46 3	27 7		44 9	30 0		54
55	49 7	23 6		48 5	25 9		47 1	28 3		45 7	30 6		55
56	50 6	24 0		49 4	26 4		48 0	28 8		46 6	31 1		56
57	51 5	24 4		50 3	26 8		48 9	29 3		47 4	31 7		57
58	52 4	24 8		51 2	27 3		49 7	29 8		48 3	32 2		58
59	53 3	25 2		52 0	27 8		50 6	30 3		49 1	32 8		59
60	54 2	25 6		52 9	28 3		51 5	30 8		49 9	33 3		60
Dep.		Lat.		Dep.		Lat.		Dep.		Lat.			
5 $\frac{1}{4}$ Point.			5 $\frac{1}{2}$ Point.			5 $\frac{3}{4}$ Point.			5 Points.				

A Table of Diff of Latitude and Departure.

A Table of Diff of Latitude and Departure.																			
Distance	3 $\frac{1}{2}$ Point.				3 $\frac{1}{2}$ Point.				3 $\frac{1}{2}$ Point.				4 Points.				Distance		
	Lat.		Dep.		Lat.		Dep.		Lat.		Dep.		Lat.		Dep.				
31	24	9	18	5	24	0	19	6	23	0	20	8	21	9	21	9	31		
32	25	7	19	1	24	7	20	3	23	7	21	5	22	6	22	6	32		
33	26	5	19	7	25	5	20	9	24	4	22	1	23	4	23	3	33		
34	27	3	20	3	26	2	21	5	25	2	22	8	24	1	24	0	34		
35	28	1	20	9	27	0	22	2	25	9	23	5	24	8	24	7	35		
36	28	9	21	5	27	8	22	8	26	7	24	1	25	5	25	4	36		
37	29	7	22	1	28	6	23	4	27	4	24	8	26	2	26	2	37		
38	30	5	22	7	29	3	24	1	28	1	25	5	26	9	26	9	38		
39	31	3	23	3	30	1	24	7	28	9	26	2	27	6	27	6	39		
40	32	1	23	8	30	9	25	4	29	6	26	9	28	3	28	3	40		
41	32	9	24	4	31	6	26	0	30	4	27	5	29	0	29	0	41		
42	33	7	25	0	32	4	26	6	31	1	28	2	29	7	29	7	42		
43	34	5	25	6	33	2	27	2	31	9	28	9	30	4	30	4	43		
44	35	3	26	2	34	0	27	8	32	6	29	5	31	1	31	1	44		
45	36	1	26	8	34	8	28	4	33	4	30	2	31	8	31	8	45		
46	36	9	27	4	35	5	29	1	34	1	30	9	32	5	32	5	46		
47	37	7	28	0	36	3	29	7	34	9	31	5	33	2	33	2	47		
48	38	5	28	6	37	1	30	3	35	6	32	2	33	9	33	9	48		
49	39	3	29	2	37	9	31	0	36	3	32	9	34	7	34	7	49		
50	40	2	29	8	38	7	31	7	37	0	33	6	35	4	35	4	50		
51	41	0	30	4	39	5	32	3	37	8	34	3	36	1	36	1	51		
52	41	8	31	0	40	3	32	9	38	5	35	0	36	8	36	8	52		
53	42	6	31	6	41	1	33	6	39	2	35	6	37	5	37	5	53		
54	43	4	32	2	41	8	34	3	40	0	36	3	38	2	38	2	54		
55	44	2	32	8	42	6	34	9	40	8	37	0	38	9	38	9	55		
56	45	0	33	4	43	4	35	6	41	7	37	6	39	6	39	6	56		
57	45	8	34	0	44	2	36	2	42	2	38	3	40	3	40	3	57		
58	46	6	34	6	45	0	36	8	43	0	39	0	41	0	41	0	58		
59	47	4	35	2	45	8	37	4	43	8	39	6	41	7	41	7	59		
60	48	2	35	7	46	4	38	1	44	5	40	3	42	4	42	4	60		
Dep.		Lat.		Dep.		Lat.		Dep.		Lat.		Dep.		Lat.					
4 $\frac{1}{2}$ Point.				4 $\frac{1}{2}$ Point.				4 $\frac{1}{2}$ Point.				4 Points							

The Use of the Table of Difference of Latitude and Departure.

THis Table on each Page contains ten Columns, in the two outmost Columns of each Page stands the word *Distance*, it begins on the left hand Page at 1, and is continued to 30, and on the right hand Page it begins at 31 and is continued to 60; in these Columns you must find your Distance sailed: the other Columns of each Page are distinguished by the Points and quarter Points of the Compasses, beginning at $\frac{1}{4}$ Point, and so $\frac{1}{2}$ Point, $\frac{3}{4}$ Point, 1 Point, and so increasing to 4 Points at the head of the Table, and beginning at 4 Points and increasing backward to 7 Points $\frac{3}{4}$ at the Foot of the Table; every quarter Point containing two Columns, distinguished by the words *Lat.* and *Dep.* signifying the Difference of Latitude and Departure, at the head and foot of the Table.

The chief Use of this Table is this, the Course and Distance being given to find the Diff. Latitude and Departure.

I. Example.

A ship sails S.E. by S. $\frac{1}{2}$ E. 57 m. or miles, I demand the Difference of Latitude and Departure.

Note, your Course must always be accounted from the North or South Point of the Compass, according as your Course is Northerly or Southerly.

So your Course being S.E. by S. $\frac{1}{2}$ E. it is 3 Points $\frac{1}{2}$ from the South towards the East, and therefore your Difference of Latitude is Southerly and your Departure Easterly; Turn to the Table of Difference of Latitude and Departure, and look for 3 Points $\frac{1}{2}$ which you will find at the head of the Table, then look for your Distance 57 in the Column of Distance, which you will find upon the right hand Page, then right against 57 m. in the Distance, and under 3 Points $\frac{1}{2}$ the Course, under

The Use of the Table, &c.

under Lat. your Diff. Lat. is 44.2 and under Dep. your Departure 36.2, that is, your Diff. Lat. is 44 miles & 2 tenths of a mile and your Departure 36 miles and 2 tenths.

Example II. *A Ship sails N.W. by W. $\frac{1}{4}$ W. 46 leagues I demand the Difference of Latitude and Departure.*

The Course is 5 Points $\frac{1}{4}$ from the North toward the West, therefore your Diff. Lat. is Northerly, and your Departure Westerly: Look for 5 Points $\frac{1}{4}$, which you will find at the foot of the Table, and 46 your distance on the right hand Page, then right against 46 and over 5 Points $\frac{1}{4}$ you will find your Diff. Lat. over the word Lat. at the foot of the Table, to be 23 leagues and 6 tenths, and your Departure over the word Dep. to be 39 leagues and 4 tenths of a league.

(II.) How to work a Traverse by the Tables of Difference of Latitude and Departure.

Example. *Suppose a Ship sail upon her direct Course N.W. $\frac{1}{2}$ W. 50 miles or min. but then by reason of contrary winds sails N.N.E. $\frac{1}{2}$ E. 20 miles, and S.W. $\frac{1}{2}$ W. 27 miles, and then N.N.W. $\frac{1}{4}$ W. 22 miles, and W.N.W. $\frac{1}{4}$ W. 25 miles, to find the Diff. Latitude and Departure.*

Make a Table of six Columns as here underneath, in the two first Columns insert your Course and Distance.

The Traverse Table.

Course sailed.	Dist. miles	Diff. Lat.	Departure
N. W. $\frac{1}{2}$ W.	50	31 7	38 7
N. N. E. $\frac{1}{2}$ E.	20	17 6	09 4
S. W. $\frac{1}{2}$ W.	27	17 2	21 0
N. N. W. $\frac{1}{4}$ W.	22	19 9	09 4
W. N. W. $\frac{1}{4}$ W.	25	06 0	24 2
		75 2	17 2 09 4 93 3
		17 2	09 4
Diff. Lat.		58 0	Departure 82 9

The Use of the Table, &c.

Then by the Table of Difference of Latitude and Departure find your Difference of Latitude and Departure for your several Courses and Distances by the former directions, and place it in their proper Columns, that is, if your Course is between the North and the East, place your Difference of Latitude in the North Column, and your Departure in the East. If your Course is between the North and the West, put your Difference of Latitude in the North Column and your Departure in the West. If it is between the South and the East, your Difference of Latitude in the South Column and your Departure in the East. If it is between the South and the West, your Difference of Latitude in the South Column and your Departure in the West.

If the Ship sail directly North or directly South, she only makes Difference of Latitude, which is Northerly or Southerly according to the Course, and if she sail directly East or West, she only makes Departure, which is Easterly or Westerly according to the Course. Having thus placed your Difference of Latitude and Departure in their proper Columns of North, South, East and West, as you see in the foregoing Table; the Sum of the North Column is 75.2, of the South 17.2, of the East 9.4, and of the West 93.3, then consider the Sum of the North and South Columns which is greatest, and subtract the least therefrom, and so likewise of the East and West Columns. So in the foresaid Table the South Column subtracted from the North, the Remainder is 58.0, which is the Difference of Latitude Northerly, and the East Column subtracted from the West, the Remainder is 83.9, which is the Departure Westerly, which was required to be found.

VIEW

N	S	E	W
75.2	17.2	9.4	93.3
58.0		83.9	

A

A Table shewing what day of the week the first day of March falls on; also the Epact, Dominical Letters, first Sund in Lent, Easter-day & Whitsunday for 20 years

Anno Dom.	First of March.	Epact	Lent. Sund.	Shrove-Sunday.	Easter-Sunday.	Whit-Sunday.
1674	Sunday	3	D	March 1	April 19	June 7
1675	Munday	14	C	Febr. 14	April 4	May 23
1676	Wednesday	25	B	Febr. 6	Mar. 26	May 4
1677	Thursday	6	G	Febr. 25	April 15	June 3
1678	Friday	17	F	Febr. 10	Mar. 31	May 19
1679	Saturday	28	E	March 2	April 20	June 8
1680	Munday	9	DE	Febr. 22	April 11	May 30
1681	Tuesday	20	B	Febr. 13	April 3	May 22
1682	Wednesday	1	A	Febr. 26	April 16	June 4
1683	Thursday	12	G	Febr. 18	April 8	May 27
1684	Saturday	23	FE	Febr. 10	Mar. 30	May 18
1685	Sunday	4	D	March 1	April 19	June 7
1686	Munday	15	C	Febr. 14	April 4	May 23
1687	Tuesday	26	B	Febr. 6	Mar. 27	May 15
1688	Thursday	7	A G	Febr. 26	April 15	June 13
1689	Friday	18	F	Febr. 10	Mar. 31	May 16
1690	Saturday	29	E	March 2	April 20	June 8
1691	Sunday	11	D	Febr. 23	April 12	May 31
1692	Tuesday	22	CB	Febr. 7	Mar. 27	May 15
1693	Wednesday	3	B	Febr. 26	April 16	June 4

The Perpetual Almanack.

Days the same as the First of March.

March	1	8	15	22	29	November
August	2	9	16	23	30	August
May	3	10	17	24	31	January
October	4	11	18	25	00	October
April	5	12	19	26	00	July
September	6	13	20	27	00	December
June	7	14	21	28	00	February

The Use of this Almanack.

BY the former Table you may see what day of the week the first of *March* falls on in any of those years, which being known you may readily find any day of the Week or Month throughout the year.

Example.

If you would know what day of the Week the 7. of *June* is 1675. Having seen by the Table that the first of *March* is *Munday*, look in the Column of the Almanack below against *June* or *February*, and you will find that the 7. 14. 21. 28. days of those Months are *Mundays*. Again, if you would know what day of the Month the third *Sunday* in *May*, 1676 is, that year the first of *March* falling on *Wednesday*, looking in the Column in the Almanack even with *May* and *January*, I find the third *Wednesday* of those Months to be the 17. day, and so the third *Sunday* to be the 21. day. Thus by knowing what day of the week the first day of *March* falls on in any year, the number of the days even with the said Months are of the same day of the Week, whether *Sunday*, *Munday*, *Tuesday*, &c. for ever.

A Table of the Angles which every Rhomb (or Point of the Compass) makes with the Meridian.

NORTH.	SOUTH.	Point	D. M.	NORTH.	SOUTH.
			02 49		
			05 37		
			08 26		
N. by East	S. by East	1	11 15	N. by West	S. by West
			14 04		
			16 52		
			19 41		
N.N.E.	S.S.E.	2	22 30	N.N.W.	S.S.W.
			25 19		
			28 07		
			30 56		
N.E. by N.	S.E. by S.	3	33 45	N.W. by N.	S.W. by S.
			36 34		
			39 22		
			42 11		
North East	South East	4	45 00	Nor. West	Sou. West
			47 49		
			50 37		
			53 26		
N.E. by E.	S.E. by E.	5	56 15	N.W. by W.	S.W. by W.
			59 04		
			61 52		
			64 41		
E.N.E.	E.S.E.	6	67 30	W.N.W.	W.S.W.
			70 19		
			73 07		
			75 56		
E. by North	E. by South	7	78 45	W. by Nor.	W. by Sou.
			81 34		
			84 22		
			87 11		
East.	East.	8	90 00	West	West.

The Names of the most useful Mathematical and Sea-Books in English.

The Mariners Magazine containing the Art of Navigation, Surveying, Gauging, Gunnery, Astronomy, Dialling and Fortification. By Capt. Sam. Sturmy, Folio.

Gellibrand's Trigonometria Britannica. Folio.

The Coasting Pilot, with new Sand-Draughts, by J. Seller.
The Safe-guard of Sailors, and Pilots Sea-Mirror, being an Epitome of the largest Wagoner.

Practical Navigation, being an Introduction to the whole Art, with the Use of Sea-Instruments, by J. Seller.

Collins Sector on a Quadrant, or the description and use of four general Quadrants, two large and two small, exquisitely cut by Henry Sutton: Or the Prints sold alone.

The Geometrical Seaman, shewing how the three kinds of Sailing by the plain Chart, Mercator's Chart, and Great Circle may be easily performed by Geometry, only by a Plain Scale and Compasses: with two new Traverse-Tables added. The best way of keeping an Account of any Voyage by Latitude and Longitude according to the Globe by H. Philipps.

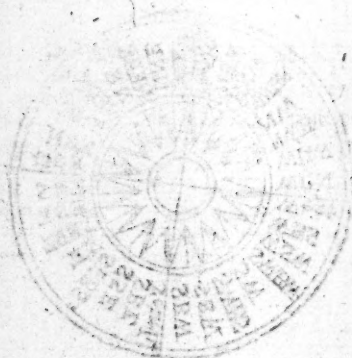
Gunter's Works. Wright's Correction of Errors.

Norwood's Triangles. Seaman's Practice. Seaman's Kalender. Seaman's Companion. Seaman's Secrets.

Mate for Mariners. Seaman's Lictionary. Seaman's Glass. Euclid's Elements of Geometry. Ny's Art of Gunnery. Use of the Globes. Light to the Longitude. Boatwain's Art. Complete Shipwright. Complete Modellist. Mathematical Manual. Mariners Compass rectified. Use of the Carpenters Rule, and Gunter's Line of Numbers.

With any other Mathematical and Sea Books, Wagoners, Sea Charts or Books of any other Subject, as, Divinity, History, Philosophy, &c. are sold at the cheapest Rate by William Fisher, Bookseller, at the ancient Shop at the Postern-Gate near Tower-Hill; where also you may have any sort of Paper or Paper-Books ruled or unruled, Bibles or other Books new bound and claspt, and the best Ink for Records.





un
ou
ly
w
th
of
as
ti
co
in
an
S:
le
to
O
H
an
A
an
th



The BOOKSELLER to the R E A D E R.



Having formerly Printed Mr. Gellibrand's Institution Trigonometrical, with those exact Tables of Natural and Artificial Sines and Tangents, and Logarithms of Natural Numbers, which were generally accepted and well approved of by most that understood the Mathematicks: and it being now scarce and out of Print, I had thought to have reprinted it as formerly, but understanding that Mr. Gellibrand's Institution was somewhat obscure, and besides contained nothing of the Use and Application of Triangles in the three kinds of Sailing, and for this reason not so proper for Seamen, as this which I here present thee with; I altered my intentions, and have instead of Mr. Gellibrand's Institution, collected the Doctrin of Plain and Spherical Triangles in a plainer Method, and have thereunto added the Use and Application of Triangles in Plain Sailing, Mercator's Sailing and Great Circle Sailing; likewise in Problems of Astronomy and Geography, wherein is shewn to find the Suns Declination, Right Ascension and Oblique Ascension, the Hour of Sun-Rising, the Hour at any Altitude or Azimuth, and the Azimuth and Altitude at any Hour, the Suns Amplitude and Azimuth, and thereby the Variation of the Compass, and how to rectifie the Course thereby, with many other things useful in the Art of Navigation, likewise I have

To the Reader.

added these useful Tables, *that is*, a brief Table of Meridional Parts *that may be used to every Minute of Latitude*, a Table of the Suns Right Ascension, a Table of the Suns Declination *exactly calculated*, a Table of the Latitude and Longitude of the Principal Ports, Head-Lands and Islands in the world, an *exact* Table for the easie working of a Traverse, together with a perpetual Almanack. And lastly, I have hereunto annexed Tables of the Logarithm Sines and Tangents (*purposely omitting the Complements Arithmetical, because I was unwilling to cumber the Pages with that which may be easily supplied by the Direction in Page 4.*) together with a Table of the Logarithms of Natural Numbers from 1 to 2000, which are carefully corrected according to Mr. Gellibrand's Tables.

All this I have carefully contrived for thy advantage, so that I think there is no Book of Navigation of this Volume extant, that contains so much useful matter as this Treatise; which, *that it may turn to the Benefit of both Buyer and Seller, is the desire of*

Thy Friend to serve thee,

William Fisher.

CHAP.

CHAP. I.

Containing the brief Use of the Table of Logarithms for Numbers, and of the Logarithmical Sines and Tangents.

I. The Use of Logarithms for Numbers.

THis Table contains the Logarithms of Numbers increasing in their natural order, from 1 unto 1000; every page containing 100 Log. marked at top with 100, 200, 300, &c. and their use is,

1. A Number being given to find the Logarithm thereof.

Suppose the given Number were 129; to find the Logarithm thereto.

Upon the page marked with 100, under (Num.) at the top of the page, look for the Number 129, and in the next adjoining Column under (Logarith.) is 1.3598355, which is the Logarithm sought.

Suppose you were to find the Logarithm of 1497.

In the page marked with 1400, under (Num.) you will find the Number 1497, and in the adjoining Column under (Logarith.) 3.1752218 the Logarithm sought.

2. A Logarithm being given to find the Number corresponding

Suppose the given Logarithm were 2.9813655, to find the Number answering thereto.

Run down the Columns under (Logarith.) and in the page marked with 900, you will find this Logarithm, and the Number answering thereto is 958 which was required.

Suppose the Logarithm given were 3.101852, to find the Number answering thereto.

Look down those Columns of Logarithms that begin with 3, and in the page marked with 1200, you will find the nearest Logarithm thereto to be 3.1017471, and the Number answering thereto to be 1264, which was required.

II. The Use of the Table of Logarithmical Sines and Tangents.

This Table contains the Logarithmical Sines and Tangents of every Degree and Minute of the Quadrant; and their Uses,

1. To find the Sine or Tangent of any Degree and Minute.

If the Degrees be less than 45, your Sine or Tangent is found in those Columns which are distinguished by the words (*Sine*) (*Tang.*) at the head of the Table. But if the Degrees exceed 45, then your Sine or Tangent is found in those Columns which are distinguished with the words (*Sine*) (*Tang.*) at the foot of the Table.

Suppose you were to find the Log. Sine or Tangent of 32 d. 12 m. Look for 32 d. at the head of the Table, and upon the left hand page in the Column of Minutes under the word (*Minut.*) you will find 12 m. and against 12 m. and under (*Sine*) at the head of the Table you shall find 9.7266264 which is the Log. Sine of 32 d. 12 m. and against 12 m. and under (*Tang.*) you have 9.7991569, the Log. Tangent of 32 d. 12 m.

Suppose you were to find the Log. Sine or Tangent of 37 d. 47 m. Turn to 37 d. at the head of the Table, and upon the right hand page (because the Minutes exceed 30) in the Column of Minutes, under (*Minut.*) you must look for 47 m. and against 47 m. and under (*Sine*) at the head of the Table you will find 9.7872317, the Sine of 37 d. 47 m. and against 47, and under (*Tang.*) you will find 9.8894214, the Tangent of 37 d. 47 m.

Suppose you were to find the Log. Sine or Tangent of 64 d. 15 m. Turn to 64 d. at the foot of the Table, and upon the right hand page, in the Column of Minutes, over the word (*Minut.*) look upwards for 15 m. against 15 m. and over (*Sine*) at the foot of the Table, you will find 9.9545793, the Sine of 64 d. 15 m. and against 15 m. and over (*Tang.*) you will find 10.3166443, the Tangent of 64 d. 15 m.

Sup-

Logarithms, Sines and Tangents.

3

Suppose you were to find the Log. Sine or Tangent of $78^{\circ} 45'$. Turn to 78° at the foot of the Table, and upon the left hand page (because the Minutes exceed 30) in the Column of Minutes over (*Minut.*) look for 45 *m.* against 45, and over (*Sine*) you find the Sine of $78^{\circ} 45'$. to be 9.9915739, and the Tangent in the same Line over (*Tang.*) to be 10.7013382.

2. *A Logarithm, Sine or Tangent being given, to find the Degrees and Minutes answering thereto.*

This is but the Converse of the former, but that you may the more readily turn to the Degree and Minute required, take this brief Direction.

If it be a Sine, and the five first Figures less than 9.8494, or a Tangent less than *Radius*, or 10.0000000, then it is a Sine or Tangent of less than 45° and is to be sought in those Columns distinguished with (*Sine*) (*Tang.*) at the head of the Table. But if the Sine or Tangent exceed these respective Numbers, then the Degrees answering thereto are more than 45° , and they are to be found in those Columns distinguished by (*Sine*) (*Tang.*) at the foot of the Table.

Suppose you were to find the Degrees and Minutes corresponding to this Sine 9.7035329; this being less than 45, I run over the Columns of Sines, distinguished by (*Sine*) at the top, and under 30° and against 21 *m.* I find the given Sine.

Suppose I were to find the Degree and Minute corresponding to this Tangent 10.3862939: This being greater than 45 *d.* I run over the Columns of Tangents, distinguished by (*Tang.*) at the foot of the Table, and over 67° and against 39 *m.* I find the nearest less, viz. 10.3860000, and therefore the nearest Degree and Minute corresponding are $67^{\circ} 39'$.

(I.) *Note,* If you are to find the Sine or Tangent of any Number of Degrees and Minutes exceeding 90° : as, suppose you were to find the Tangent of $127^{\circ} 43'$. subtract $127^{\circ} 43'$ from $180^{\circ} 00'$. and find the Tangent of the remainder, viz. the Tangent $52^{\circ} 21'$. which is also the Tangent $127^{\circ} 43'$. as was required.

A 2

(II.) *Note,*

(II.) Note, That if it be required to find the Sine Comp. or Tangent Comp. of any Degree and Minutes less than 90 d. you must look the Degrees and Minutes as is before directed, and under (*Sine Complement*) or (*Tangent Complement*) at the head of the Table. If your Degrees be less than 45 d. or over (*Sine Complement*) or (*Tangent Complement*) at the foot of the Table if your Degrees exceed 45 ; you will find against the respective Minutes, the Sine Complement or Tangent Complement required.

Suppose it were required to find the Sine Complement or Tangent Complement of 36 d. 49 m. Turn to 36 d. at the head of the Table, and under (*Sine Complement*) and right against 49 m. you will find 9.9033923, and under (*Tangent Complement*) 10.1257796, which is the Sine Complement and Tangent Complement required.

To find readily the Complement Arithmetical of a Logarithm.

The Complement Arithmetical of a Logarithm is the residue of that Logarithm to 10.0000000, or to 20.0000000, as the Complement Arithmetical of 9.9198464 is 0.0801536, for if you subtract 9.9198464 from 10.0000000, the remainder is 0.0801536. But a readier way is thus ; Take the residue or remainder of the first Figure to 9, and so of the rest until you come to the last Figure, which take unto 10. Thus, to take the Complement Arithmetical of 9.9198464, for 9 put 0 ; for 9, 0 ; for 1, 8 ; for 9, 0 ; for 8, 1 ; for 4, 5 ; for 6, 3 ; for 4 (the last Figure) 6 ; and so I have 0.0801536 the Complement Arithmetical as before. If there be two Figures before the full Point, as 10, 11, 12 or 13, you must then reject the first Figure and take the Complement Arithmetical of the other as before. As suppose you were to find the Comp. Arithmetical of 10.9652480, reject the first 1, then for 0 write down 9 ; for 6, 3 ; for 9, 0 ; for 5, 4 ; for 2, 7 ; for 4, 5 ; for 8, 2, being the last Figure is 0, and then the Cypher is the last place, so the Complement Arithmetical is 9.0347520,

CHAP. II.

Containing the Doctrin of Plain Triangles, right Angled and Oblique.

Triangles are either Plain or Spherical.

Of Plain or right lined Triangles.

Here, first take a few general Rules about them.

1. A plain or right lined Triangle is a plain Figure contained or comprehended within three right or streight Lines, joined together with three Angles or Corners.

2. These plain Triangles are either Right-angled, that is, having one right Angle, or else Oblique-angled, that is, without a right Angle, and having all the three Angles either acute, that is, less than 90° . or else one of them obtuse, that is, more then 90° .

3. In either sort of these Triangles the three Angles are always equal to two right Angles, that is, 180° .

4. In a Right-angled Triangle, the right Angle being always 90° . the other two Angles make also just 90° . in such manner that one is the Complement of the other, so that one of them being known the other is also known.

5. The Lines about the Triangle, some call them Sides, some Legs: But in right-lined Triangles for better distinction it will be best to call B A the Bottom-Line, the Base, C A the upright Line, the *Perpendicular*, and B C the slope-Line, the *Hypotenuse*.

6. Every Triangle hath six parts, to wit, three Sides and three Angles, and these are all proportional one to another, so that any three of them being known, the other three may be found out; unless it be the three Angles of a plain Triangle, which only shews the Proportion, but you may make the Lines what length you will.

7. If any Angle exceed 90° . subtract it out of 180° . and work by the Remainder.

Of Right-Angled Triangles.

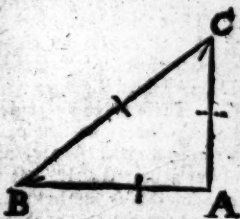
(I.) Of Right-angled Plain Triangles.

PROPOSITION I.

Two Angles and one Side of a Right-angled Triangle being given, to find the other Sides and Angle.

Example. In the Right-angled Triangle B A C, the Angle at A, being known to be a right Angle or 90 d. and the Angle at B, being known to be 36 d. 52 m. and the Side B C, being known to be 350 inches, feet, yards, poles, miles, leagues, or any other kind of measure; How may I find hereby the other two Sides and the other Angle?

First, to find the Angle unknown which is the Angle at C, you must remember the fourth Rule before-going; and so this being a Right-angled Triangle, the Angle at C is the Complement of the Angle at B. Take therefore the Angle B, 36 d. 52 m. out of 90 d. and there rests for the Angle at C, 53 d. 8 m. which is the other Angle.



Secondly, to find the Side C A, your best way is to work by its proportion to the Angle opposed thereunto at B.

As the Sine of any Angle, To the parts of the Side opposed thereunto: So is the Sine of any other Angle, To the parts of the Side opposed thereunto.

And so on the contrary, *As the parts of any Side, &c.*

So that in this Triangle B A C, having the Side B C 350, opposed to the Angle at A 90 d. you may thereby find the Side A C, which is opposed to the Angle at B, that Angle being known to be 36 d. 52 m. for,

<i>As the Radius or Sine of the Angle at A, 90 d.</i>	10,0000000
<i>To the opposite Side B C, 350</i>	2,5440680
<i>So is the Sine of the Angle at B 36 d. 52 m.</i>	9,7781186
<i>To the opposite Side A C, 210</i>	22,3221866
	Add

Of Right-Angled Triangles.

7

Add the second and third Numbers together, and from the Sum subtract the first, which because it is the Radius, it is done by cancelling the first Figure 2, to the Remainder is 2.321866 which is the Log. of 210 for the Side desired.

Thirdly, by the same Rule you may find the remaining Side B A, which is yet unknown, by its proportion to the opposite Angle at C, which was found to be 53 d. 8 m.

As the Radius or Sine of 90 d. 10.0000000

To the Side opposed B C, 350 2.5440680

So the Sine of the Angle C, 53 d. 8 m. 9.9031684

To the Side B A, 280 21.4471764

Which cancelling the Radius, the Remainder is the Logarithm of 280, for the Side B A; and thus you have found all the six parts of the Triangle.

PROP. II.

Two Sides, one of them opposite to the right Angle, being given, to find the rest of the Parts of the said Triangle.

The right Angle being opposed unto one of the given Sides, you may work by the Proportion of the opposite Sides and Angles, For

As the Parts of any known Side, To the Sine of the Angle opposed thereunto: So the Parts of any other Side, To the Sine of the Angle opposed thereunto.

Example. In the Triangle A B C, let the two given Sides be A B, 280, and B C, 350, which Side B C, is opposed to the Angle A, being known to be 90 d.

First, to find the Angle at C, opposed to the Side A B.

As the Side B C 350 Log.

To the opposite Angle A, 90 d.

So the Side A B, 280

Sum

To the Sine of the Angle C, 53 d. 8 m.

A 4

2.5440680

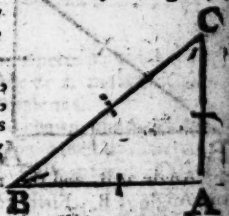
10.0000000

2.4471580

12.4471580

9.9030900

Add



Of Right-Angled Triangles.

Add the second and third Numbers, and from the Sum thereof subtract the first, the Remainder is the Sine of the Angle desired, which is 53 d. 8 m. almost.

Secondly, now this Angle being known, the Angle at B is the Complement thereof, which is 36 d. 52 m.

Thirdly, for the Side C A, having found the opposite Angle at B to be 36 d. 52 m. you may best find it as before in the last Proposition.

As the Radius or Sine of the Angle at A 90 d.	10.000000
To the opposite Side B C 350	2.5440680
So is the Sine of the Angle at B 36 d. 52 m.	9.7781186
To the Side A C 210	<u>21.3221866</u>

You might have found it also by the Side A B, and the Angles B and C; but to work by the Radius is somewhat the readier way.

PROP. III.

In a Right-angled Triangle, the two Sides including the right Angle being given to find the rest of the parts of the Triangle.

Example. In the Triangle B A C, suppose the Side B A to be 280, and the Side A C to be 210, and the Angle A between them to be a right Angle 90 d. to find the other parts of this Triangle.

You may make either Side the Radius, but we will suppose the Side B A to be the Radius; so the Side A C is the Tangent of the Angle at B, and the Angle at C is the Complement of the Angle at B. First, to find the Angle B.

As the one Side B A, 280 Log.	2.4471580
To the other Side A C, 210	2.3222193
So is the Radius 90 d.	10.0000000

	<u>Sum</u>
To the Tangent of 36 d. 52 m.	12.3222193
	<u>9.8750613</u>
	Which

Of Oblique Triangles.

9

which is the Angle at B, the Complement whereof being 53 deg. 8 min. is the Angle at C. Then for the Side BC.

As the Sine of the Angle B 36 d. 52 m. 9.7781186

To its opposite Side AC 210 2.3222193

So the Radius, or 90 d. 10.0000000

Sum 12.3222193

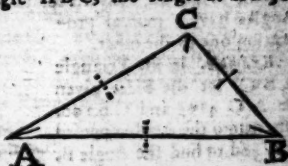
To its opposite Side BC, 359 2.5441007

(2) Of Oblique Triangles.

PROPOSITION I.

Two Angles of an oblique Triangle being given, and a Side opposed to either of them, to find the rest of the parts thereof.

Example. In the Triangle ABC, the Angle at A is 30. the Angle at B is 45, and the Side BC is 290. To find the rest of the parts of this Triangle. First, to find the Angle C, it is the Complement of the other two Angles to 180; for the three Angles always make 180 d.



as in the third Rule: So that these two Angles A, being 30 d. and B 45 d. being added together, make 75 d. and their Complement to 180. being 105 d. is the Angle at C.

Secondly, the Angles being all thus known, the Sides unknown may be found by their Proportion to their opposite Angles, as before, for the Proportion holds also in these. Thus to find the Side AC.

As the Sine of the Angle A 30 d. 9.6989700

To the Side opposed to it CB 290 2.4623980

So the Sine of the Angle B 45 d. 9.8494850

Sum of the second and third 12.3118830

To the opposite Side AC 410 2.6129120

In

In such cases as these, when you have a Sine or Tangent in the first place, you may work by the Arithmetical Complement thereof, and so save the Subtraction.

Thirdly, then to find the other Side AB , by the opposite Angle at C , which is 105 . Here because the Angle exceeds 90 d. you must work by the Complement to 180 which is 75 .

As the Sine of A 30 d. Arith. Compl. 0.3010300

To the Side opposed to it CB 290 2.4623980

So the Sine of the Compl. 105 . viz. Sine 75 9.9849438

To the Side opposed AB 560 22.7483718

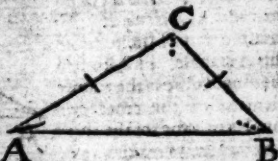
Thus have you all the parts of the Triangle.

PROP. II.

Two Sides and an Angle opposed to one of them, being given, to find the other Angles and the third Side.

This is but the converse of the former, for the Sides and Angles have a mutual proportion one to the other.

Example. In the Triangle ABC , let the Sides given be AC 410 , and CB 290 , wherunto the Angle opposed is A 30 d. to find the Angle B ,



As the Side CB 290 Comp. Arith. 6.5376010

To the Sine of the opp. Angle A 30 d. 9.6989700

So the Side AC 410 3.6127818

To the Sine of the the opposite Angle B 29.8493558
which is 44 deg. 59 min.

Now the Angle A being 30 deg. and B 44 d. 59 min. which make 74 d. 59 m. the Angle C must be 105 d. 1 m. the Complement to 180 ; and the Side opposed thereto 560 , as was found before.

PROP. III.

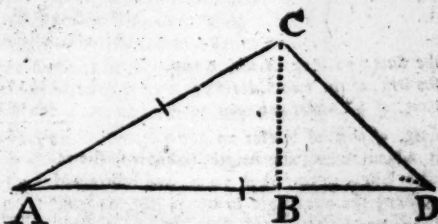
Two Sides of an Oblique Triangle, with the Angle contained between them being given to find the other Angles and Side.

In the Triangle ACD let the Side AC be 410 , and the Side

Of Oblique Triangles.

11

Side AD 560, and the Angle between them at A 30 deg. and it is required to find the other two Angles, and the Side CD.



To resolve this oblique Triangle, it is a good plain way to part it into two right-angled Triangles, by letting fall the perpendicular CB from the Angle C. To perform which,

First, for the right Angle ABC, you have the Hypotenuse AC 410, and the Angle at A 30 d. Therefore as in Proposition 1. by the Rule of opposite Proportion :

As Sine B 90 deg. to AC 410.

So Sine A 30 deg. to CB 205.

And again,

As Sine B 90 deg. to AC 410.

So Sine C 60 deg. to AB 355.

Thus you have all the Sides and Angles of the one of those Triangles ACB.

Secondly, for the other Triangle, which is CBD, subtract the Side AB, which was found to be 355 from the whole Side AD that is 560, and there rests 205 for the Side BD: and thus you have the two Sides of the Triangle CBD, viz. CB 205, and BD 205; and so you may, as in Prop. 3. find the Angle D, by Tangents.

As BD to BC, so Rad. to Tang. D 45 d.

Lastly, for the Side CD, by opposite proportion,

As Sine D 45 d. to BC, so Sine B 90 d. to CD 290.

Another

Of Oblique Triangles.

Another way to perform this.

Take the Sum of the two Sides, and the difference of them, and work thus.

Side	AD	56
Side	AC	41
Sum		97
Diff.		15
		7.013228
		2.176091
		10.571947
		29.761267
	d.	
	75	
	29	
	104	
	45	

As the Sum 970, Log. Arith. Comp.

To the Diff. of the two Sides 150

So Tang. of $\frac{1}{2}$ Angles unknown 75 d.

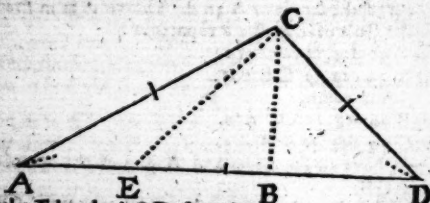
To Tang. of Diff. of Angles 29 d. 59 m.

This added to half the Angles unknown, shews the greater Angle to be 104 d. 59 m. and subtracted from it, shews the less Angle to be 45 deg. 01 min.

And thus having all the Angles, you may find the unknown Side CD, by its opposite Angle at A

PROP. IV.

Having the three Sides of an Oblique Triangle to find the Angles



In the Triangle ACD, suppose the greater Side AD be 560, the two lesser Sides

AC	410
CD	290

The Sum of these two

700

The Difference of them

120

As the greatest Side 560 Com. Ar.

7.251820

To Sum of the the two lesser 700

2.8450080

So the Differ. of them 120

2.0791812

To a fourth number 150

2.1760112

This

Of Spherical Triangles.

13

This 150 is A E, a part of the greatest Side, which being subtracted from it, the perpendicular will fall in the middle of the Remainder thereof; and so part it in two right-angled Triangles.

Thus the greater Side A D being 560

The part to be subtracted A E 110

There remains E D 410

The half whereof is D B 205

which is the place where the perpendicular C B falls, and is the Base of the lesser Triangle D B C: and this subtracted from the greater Side leaves 355, for the Base of the greater Triangle A B C.

Now having these two Bases of these two Triangles, and their Hypotenuses 410, and 290 given before, you may by the rule of opposite Sides to their Angles find all the Angles.

1. In the Triangle A B C,

As A C, 410, to Sine B 90 deg.

So A B, 355, to Sine C 60 deg.

The Complement whereof is the Angle A 30 deg.

2. Then in the Triangle C B D,

As C D 290, to Sine B 90 d.

So B D 205, to Sine C 45 d.

whose Complement is the Angle at D 45 d.

Thus in the first Triangle A C D, we have found the Angle at A to be 30 d. the Angle at D to be 45, and the two Angles at C to be 60 d. and 45 d. that is in all 105 d.

CHAP. III.

Containing the Doctrine of Spherical Triangles.

Here likewise you may take a few general Rules for the better understanding these Triangles.

1. These Spherical Triangles consist of six parts, that is, three Sides and three Angles, any three of which being known, the rest may be found out.

2. The

3. The three Sides of a Spherical Triangle are parts of three great Circles of a Sphere, and as the Sides of Triangles are measured by a Scale of equal parts, so these can be measured by an Arch of equal degrees.

3. A great Circle is any such Circle as divides the Sphere into two equal parts; as the Equinoctial, the Ecliptick, the Meridians, &c.

4. The Sum of the Sides of a Spherical Triangle are less than two Semicircles.

5. The Sum of the three Angles of a Spherical Triangle is greater than two right angles, but less than six.

6. A Spherical Triangle is either Rectangular or Oblique angular.

7. The Sines of the Angles are proportional to the Sines of their opposite Sides, and on the contrary, the Sines of the Sides are proportional to their opposite Angles.

8. In Right-angled Triangles the Side opposite to the right Angle is called the Hypotenuse, the other two are called Legs.

Of Right-angled Spherical Triangles.

CASE I.

The Hypotenuse and one of the Oblique Angles being known, to find the Leg opposite to that Angle.

In the Right-angled Triangle ABC, AB is 30 deg. and the Angle at A 23 d. 30 m. It is required to find the Leg BC opposite to the Angle at A.

As the Radius or Sine of 90 deg.

To the Sine of the Hypotenuse BC 30 d.

So the Sine of the opposite Angle A 23 d. 30 m.

To the Sine of the Leg BC 11 d. 30 m.



10.00000

9.69897

9.60067

x9.19966

CASE

Of Spherical Triangles.

15

CASE II.

The Hypotenuse and one of the oblique Angles being known, to find the Leg adjacent to that Angle.

As the Radius to the Cosine of the Angle known,
So the Tangent of the Hypotenuse to the Tangent of the Leg required.

As the Radius or 90 deg. 10.0000000

To the Cosine of A, Cos: 23. 30 9.9623978

So the Tangent of A B, Tan. 30 deg. 9.7614394

To the Tangent of A C 27 d. 54 m. 29.7238372

CASE III.

The Hypotenuse and one of the oblique Angles being known, to find the other oblique Angle.

As the Radius to the Cosine of the Hypotenuse:
So the Tangent of the Angle given, to the Co-tangent of the Angle required.

CASE IV.

The two Legs being given to find the Hypotenuse.

As the Radius to the Cosine of one of the Legs,
So the Cosine of the other Leg, to the Cosine of the Hypotenuse.

CASE V.

The two Legs being given to find either of the oblique Angles.
As the Sine of the Leg next the Angle required, is to the Radius,
So is the Tangent of the opposite Leg, to the Tangent of the Angle required.

CASE VI.

One of the Legs and the oblique Angle next it being given, to find the Hypotenuse.

As the Cosine of the Angle given, is to the Radius:
So the Tangent of the Leg given, to the Tangent of the Hypotenuse.

CASE

2. The three Sides of a Spherical Triangle are parts of the three great Circles of a Sphere, and as the Sides of the Triangles are measured by a Scale of equal parts, so these may be measured by an Arch of equal degrees.

3. A great Circle is any such Circle as divides the Sphere into two equal parts; as the Equinoctial, the Ecliptick, the Meridians, &c.

4. The Sum of the Sides of a Spherical Triangle are less than two Semicircles.

5. The Sum of the three Angles of a Spherical Triangle is greater than two right angles, but less than six.

6. A Spherical Triangle is either Rectangular or Oblique angular.

7. The Sines of the Angles are proportional to the Sines of their opposite Sides, and on the contrary, the Sines of the Sides are proportional to their opposite Angles.

8. In Right-angled Triangles the Side opposite to the right Angle is called the Hypotenuse, the other two are called Legs.

Of Right-angled Spherical Triangles.

CASE I.

The Hypotenuse and one of the Oblique Angles being known, to find the Leg opposite to that Angle.

In the Right-angled Triangle ABC, AB is 30 deg. and the Angle at A 23 d. 30 m. It is required to find the Leg BC opposite to the Angle at A.

As the Radius or Sine of 90 deg.

To the Sine of the Hypotenuse BC 30 d.

So the Sine of the opposite Angle A 23 d. 30 m.

To the Sine of the Leg BC 11 d. 30 m.



10.00000
9.69897
9.60069
<hr/> 9.19966

CAL

Of Spherical Triangles.

15

CASE II.

The Hypotenuse and one of the oblique Angles being known, to find the Leg adjacent to that Angle.

As the Radius to the Cosine of the Angle known,
So the Tangent of the Hypotenuse to the Tangent of the Leg required.

As the Radius or 90 deg.	10.0000000
To the Cosine of A, Cos. 23. 30	9.9623978
So the Tangent of A B, Tan. 30 deg.	9.7614394
To the Tangent of A C 27 d. 54 m.	89.7238372

CASE III.

The Hypotenuse and one of the oblique Angles being known, to find the other oblique Angle.

As the Radius to the Cosine of the Hypotenuse:
So the Tangent of the Angle given, to the Co-tangent of the Angle required.

CASE IV.

The two Legs being given to find the Hypotenuse.

As the Radius to the Cosine of one of the Legs,
So the Cosine of the other Leg, to the Cosine of the Hypotenuse.

CASE V.

The two Legs being given to find either of the oblique Angles.

As the Sine of the Leg next the Angle required, is to the Radius,
So is the Tangent of the opposite Leg, to the Tangent of the Angle required.

CASE VI.

One of the Legs and the oblique Angle next it being given, to find the Hypotenuse.

As the Cosine of the Angle given, is to the Radius:
So the Tangent of the Leg given, to the Tangent of the Hypotenuse.

CASE

Of Spherical Triangles.

CASE VII.

One of the Legs and the oblique Angle next it being known, to find the other Leg.

As the Radius to the Tangent of the Angle given.

So the Sine of the Leg given, to the Tangent of the Leg required.

CASE VIII.

One of the Legs and the oblique Angle next it being given, to find the other oblique Angle.

As the Radius to the Side of the Angle given.

So the Cosine of the given Leg, to the Cosine of the Angle required.

CASE IX.

One of the Legs and the Angle opposed to it being known, to find the Hypotenuse.

As the Sine of the given Angle, to the Sine of the given Leg:

So is Radius, to the Sine of the Hypotenuse required.

CASE X.

One of the Legs and the Angle opposite thereto being given to find the other Leg.

As the Radius to the Tangent of the given Leg:

So is the Tangent Complement of the given Angle, to the Sine of the given Leg required.

CASE XI.

One of the Legs and an Angle opposite thereto being given, to find the other oblique Angle.

As Sine Complement of the given Leg, is to Radius:

So is the Sine Complement of the given Angle, to the sine of the Angle required.

CASE XII.

The Hypotenuse and one of the Legs being given, to find the Angle adjoining to the given Leg.

As Radius to the Tang. Compl. of the Hypotenuse:

So is Tang. of the given Leg to the Sine Compl. of the Angle required.

CASE

CASE XIII.

The Hypotenuse and one of the Legs given, to find the Angle opposite to the given Leg.

As the Sine of the Hypotenuse to Radius :

So is the Sine of the given Leg, to the Sine of the Angle required.

CASE XIV.

The Hypotenuse and one of the Legs being given to find the other Leg.

As Sine Compl. of the given Leg is to Radius :

So is Sine Compl. of the Hypotenuse, to Sine Compl. of the Leg required.

CASE XV.

The two oblique Angles being given, to find the Hypotenuse.

As the Tangent of one of the Angles, is to the Radius.

So is the Cotangent of the other Angle, to the Cosine of the Hypotenuse.

CASE XVI.

The two oblique Angles being given, to find either of the Legs.

As the Sine of one of the Angles, to the Cosine of the other Angle.

So is the Radius to the Cosine of the Leg opposed to the Angle, whose Cosine was taken.

Of Oblique Spherical Triangles.

CASE I.

Two Angles and a Side opposite to one of them being given, to find the Side opposed to the other.

Work by opposition of Sides and Angles.

As the Sine of the Angle opposed to the Side known,

To the Sine of the said Side.

So is the Sine of the Angle opposed to the Side required,

To the Sine of the Side required.

B

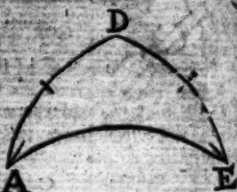
Example.

Example. In the Triangle ADE having the Side AD 30 deg. the Angle at A 23 deg. 30 min. and the Angle at E 38 d. 30 min. the question is to know the Side DE.

Work according to the Rule proposed, you shall find,

As s. E to s. AD: So s. A to s. DE.

38. 30. 30. 0 23. 30. 18. 41.



CASE II.

Two Sides and one Angle opposed to one of those Sides being given to find the Angle opposed to the other.

This is but the Converse of the last Proposition, and is performed by the proportion between the Sines of opposite Legs and Angles.

As Sine of the Side opposite to the given Angle,

To the Sine of the given Angle;

So is Sine of the other given Side,

To the Sine of the Angle required.

CASE III.

Two Sides together less than a Semicircle with the Angle comprehended given, to find one of the other Angles.

At two Operations they may be both found by a proportion demonstrated in the late Trigonometry of the learned Mr. Oughtred.

As the Sine of half the Sum of the Sides,

To Cotangent of half the contained Angle.

So the Sine of half the difference of the Sides

To the Tangent of half the difference of the Angles.

Again.

As the Cosine of half the Sum of the Sides,

To Cotangent of half the contained Angle;

So the Cosine of half the difference of the Sides,

To the Tangent of half the Sum of the other Angles.

Add the half Difference to the half Sum, and you have the greater

Of Oblique Spherical Triangles.

19

greater Angle; but subtracted from it and there remains the lesser Angle.

Example. In the Triangle

ADE, there is given,

DAE 37 d. 03 m. ADE

AE 69 d. 47 m. } and

AD 46 d. 53 m. } AED

requir'd

The Operation.

AE 69 d. 47 m.

AD 46 d. 53 m.

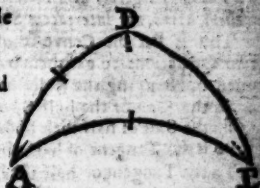
Sum 116 40

$\frac{1}{2}$ Sum 58 d. 20 m.

Differ. 22 54

$\frac{1}{2}$ Diff. 11 27

DAE 37 m. 3 m. half thereof is 18 d. 31 m.



As S. $\frac{1}{2}$ Z Cra. AE and AD 58 d. 20 m.

Co. Ar. Log. 0.07001

To S. $\frac{1}{2}$ X Cra.

11 27

9.29779

So is T. C. $\frac{1}{2}$ DAE

18 31

10.47506

To Tang. $\frac{1}{2}$ X V V D and E

34 51

19.48286

As S. C. $\frac{1}{2}$ Cra. AE and AD 58 d. 20 m.

Co. Ar. 0.27986

To S. C. $\frac{1}{2}$ X Cra.

11 27

9.99127

So is T. C. $\frac{1}{2}$ DAE

18 31

10.47506

To Tang. $\frac{1}{2}$ Z V V D and E

34 51

10.74619

$\frac{1}{2}$ Z V V D and E

79 49

$\frac{1}{2}$ X V V

34 51

Sum 114 40

ADE

} required

Rem. 44 58

AED

} required

Note. If the Sum of the two containing Sides exceed a Semicircle, then subtract each Side severally from 180 d. and proceed with those Complementments as with the Sides given in this Example foregoing, the Operation produces the Complement of the Angles sought to a Semi-circle.

B 2

CASE

CASE VI.

Two Angles together less than a Semicircle with the Side between them, alias, the interjacent Side, to find one of the other Sides.

This is but the Converse of the former to be performed at two Operations to get them both, and the proportion thence applied by changing the Sides into Angles.

As the Sine of the half Sum of the Angles,

To the Sine of half their Difference :

So is the Tangent of half the interjacent Side,

To the Tangent of half the Difference of the other Sides.

Again.

As the Cosine of the half Sum of the Angles,

To the Tangent of half the interjacent Side :

So the Cosine of half their Difference,

To the Tangent of the half Sum of the other Sides.

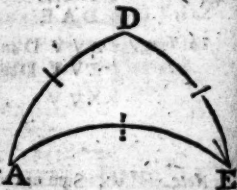
If half the Difference of the Sides be added to half the Sum of the Sides, it makes the greater Side : but subtracted from it, leaves the lesser.

Note. If the Sum of the given Angles exceed a Semicircle, subtract each Angle from a Semicircle, and proceed with the Residues, the Operation will produce each Sides Comp. to 180° .

CASE V.

Two Sides with an Angle opposite to one of them being given, to find the third Side; the kind of the Angle opposite to the other Side being foreknown.

Example. In the Triangle ADE there is given AD $46^{\circ} 53'$. DE $38^{\circ} 28'$. AED 45° . to find the Side AE.



First, find the Angle opposite to the other Side by the second Case, and then you have two Sides and their opposite Angles. Find the third Side by the following proportion.

As the Sine of half the Difference of the Angles given:

To Tangent of half the Difference of the Sides given.

So

Of Oblique Spherical Triangles.

21

So is the Sine of half the Sum of those Angles,
To the Tangent of half the Side required.

The Operation,

As Sine AD 46 d. 53 m.

To Sine AED 45 00

So is Sine DE 38 28

To Sine DAE 37 03

ADE 45 00

DAE 37 03

Sum 82 03

Differ. 07 57

AD 46 53

DE 38 28

Differ. 08 25

$\frac{1}{2}$ Sum 41 d. 01 m.

$\frac{1}{2}$ Differ. 03 58

$\frac{1}{2}$ Differ. 4 d. 12 m.

Co. Ar.

Log. 0.13670

9.84948

9.79383

19.78001

As Sine $\frac{1}{2}$ X V V A and E 03 d. 58 m.

To Sine $\frac{1}{2}$ Z V V 41 01

So is Tan. $\frac{1}{2}$ X Cra. AD and DE 04 12

To Tang. $\frac{1}{2}$ A E required 34 52

34 d. 52 m.

34 52

Doubled 69 44 A E required.

Compl. Arith.

Log. 1.16004

9.81700

8.86590

19.84303

CASE VI.

Two Sides with an Angle opposite to one of them being given, to find the Angle included, or between them, the Species of the Angle opposite to the other Side being foreknown.

First find the Angle opposite to the other Side by the Second Case, and then we have two Angles and their opposite Sides, to find the other Angle by the proportion following.

As the Sine of half the Difference of the Sides,

To the Tangent of half the Difference of the Angles :

So is the Sine of half the Sum of the Sides,

B 3

To

Of Oblique Spherical Triangles.

To the Cotangent of half the Angle required; that is, to the Tangent of an Ark, whose Complement is half the Angle required.

CASE VII

Two Angles with a Side opposite to one of them being given, to find the third Angle, the kind of the Side opposite to the other Angle being foreknown.

First, find the Side opposite to the other Angle by the first Case, and then we have two Angles and their opposite Sides, to find the third Angle, by the following Proportion.

As the Cosine of half the Difference of the Sides,
To the Tangent of half the Sum of the Angles :
So the Cosine of half the Sum of the Sides,
To the Cotangent of half the contained Angle.

CASE VIII.

Two Angles with a Side opposite to one of them being given, to find the interjacent Side, the kind of the Side opposite to the other Angle being foreknown.

First, find the Side opposite to the other Angle by the first Case, and then you have two Sides, and their opposite Angles given, to find the third Side by the Proportion following.

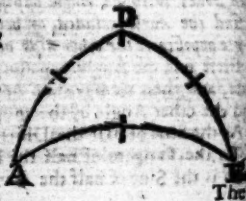
As the Cosine of half the Difference of the two Angles,
To the Tangent of half the Sum of the two Sides :
So the Cosine of half the Sum of the two given Angles,
To the Tangent of half the third Side.

CASE IX.

Two Sides and their contained Angle being given to find the third Side.

Example. In the Triangle ADE

here is given,
 DE 137 d. 55 m. }
 AD 81 50 } AE required.
 DE 38 28 }



Of Oblique Spherical Triangles.

23

The Resolution of this and the following Case is deduced from the Lord *Napiers* Catholick Proposition, (the Oblique Triangle by a supposed Perpendicular, being reduced into two Rectangulars) by *Mr. Collins*, in his Sector on a Quadrant.

The Operation.

As Radius	Log.	10 00000
To Sine Com. ADE the contained Angle 137 d. 55 m.		9.87650
So is Tang. DE the lesser Side	38 28	9.90009
To Tang. of a fourth Arch	30 31	19.77059

If the contained Angle be less than 90 deg. subtract the fourth from the greater Side; but if it be greater than 90 deg. from its Complement to 180 deg. the Remainder is the Residual Arch.

As S. C. of the fourth Arch	30 d. 31 m.	Log.	0.06476
To S. C. of the Residual	67 39		9.58008
So is S. C. of the lesser Side DE	38 28		9.89374
To S. C. of the Side required AE	110 13		19.53858

CASE X.

Two Angles and the interjacent Side being given, to find the third Angle.

Example. In the Triangle ADE,

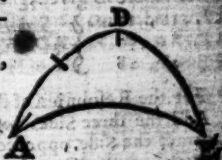
there is given,

ADE 114 d. 39 m.

DAE 37 03

AD 46 53

} AED required



The Operation.

As Radius	Logar.	10.00000
To S. C. AD the interjacent Side 46 d. 53 m.		9.83473
So is Tang. DAE the lesser Angle 37 03		9.87199
To Tang. of the fourth Arch.	27 17	19.71263

If the interjacent Side be more than a Quadrant, subtract the fourth Arch from the greater Angle, if less, from the said Angles

gles Complement to 180 d. the Remainder is the residual Arch.

		Compl. Arith.
As Sine Compl. fourth Arch	27 d. 17 m.	Log. 0.0512
To Sine Compl. residual Arch	38 04	9.8961
So is S. C. D A E the lesser Angle	37 03	9.9010
To S. C. A E D the Angle required	45 00	29.8494

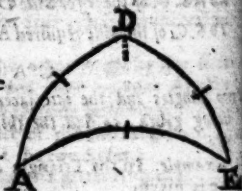
In this and the foregoing Case the affection of the required Side, or Angle, may be determined by the Residual Arch.

For if the contained Angle, or interjacent Side, be less than a Quadrant, and the Residual Arch more, or when the contained Angle, or interjacent Side is greater than a Quadrant, and the Residual Arch less, the Side or Angle required is greater than 90 d. in all other Cases less.

CASE II.

Three Sides given, to find an Angle.

Example. In the Triangle ADE there is given,
 AE 110 d. 17 m.
 AD 81 30 AD requir'd.
 DE 38 28



For the Resolution of this Case take this Direction.

Add the three Sides together, and from their half Sum subtract the Side opposite to the Angle required.

Then to the Complements Arithmetical of the Logarithm Sines of the containing Sides, add the Logarithm Sines of the half Sum and Remainder; half the total of these four Logarithms is the Sine Complement of half the Angle required.

The

Of Oblique Spherical Triangles.

25

The Operation.

AD 81 d. 50 m.	} The contain- } S.	Co. Ar.	0.28616
DE 38 28		Co. Ar.	0.00442
AE 110 13 ½	Sum 115 d. 15 m. S.		9.95639
Sum 230 31	Rem. 05 02	S.	9.94317

½ Sum 115 15 Sum 19.11014

Remain. 05 02 S. C. 68 57 ½ Sum 9.55507

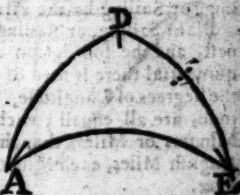
Which being doubled, produces ADE 137 deg. 54 min. required.

CASE XII.

Three Angles given to find a Side.

Example. In the Triangle ADE there is given,

ADE 137 d. 55 m.
AED 45 00 } DE required.
DAE 26 23



This Case is likewise performed by the Direction in the eleventh Case, the Angles being converted into Sides, and the Sides into Angles, by taking the Complement of the greatest Angle to a Semicircle.

Compl. ADE 42 d. 05 m.	} The adja- } S.	Co. Ar.	0.17378
AED 45 00		Co. Ar.	0.15051
DAE 26 23 ½	Sum 56 d. 44 m. S.		9.92217

Sum 113 58 Rem. 30 21 S. 9.70353

½ Sum 56 44 Sum 19.95009

Rem. 30 21 S. C. 19 15 ½ Sum 9.97504

Which being doubled gives DE 38 deg. 30 min. required.

CHAP.

CHAP. IV.

Containing Problems of Sailing by the Plain Sailing Chart, commonly called Plain Sailing.

Navigation is commonly distinguished into three sorts, Plain Sailing, *Mercators Sailing*, and Circular Sailing, or Sailing by the Arch of a great Circle.

Plain Sailing, or Sailing by the plain Chart, is the plainest, and the foundation of all the rest, and near the Equinoctial there is need of no other to be used, because there the degrees of Longitude, as well as the degrees of Latitude, are all equal; each Degree being divided into Minutes or Miles, though they are somewhat more than English Miles, each Minute or Mile containing about 6000 Feet.

In this Art the Seaman hath these helps.

First, he hath his Compass to direct him which way he goes; which is divided first into four Cardinal Points or Quarters, East, West, North, South; and each of these Quarters are divided into eight equal parts, commonly called Rumbs, making in all 32 Points. So that steering by the Compass, well made and duly rectified, the Seaman always knows which way he sails, to a very small matter.

The second help the Seaman hath in keeping his account, is a careful observation (by the Log-line or some other good way) how many Miles or Leagues he sails every hour, and so every watch, and every day.

The third help is the knowledge and observation of the Latitude, both of the place from whence he sails, and where he is arrived, or whither he is to sail.

And

And out of these three things, by the Doctrine of plain triangles, he comes to know all that is necessary for the keeping of his account: so that he may know at any time where he is, how far he hath sailed, and how far he is yet to sail, and which way, or upon what Point of the compass he is to steer, and all this by these few plain Rules of Right-lined Rectangular Triangles.

PROBLEM I.

The Course and Distance given, to find the Difference of Latitude, and the Departure.

Example. A Ship sailing N. E. by N. 37° minutes, I demand her Difference, Latitude and Departure.

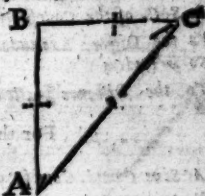
In the Triangle A B C,
A C represents the Distance sailed.

A B the Differ. Latitude.

B C the Departure.

B A C the Angle of the Course from the Meridian.

A C B the Complement of the Course.

*The Operation.*

For the Differ. Latitude.

As Radius

Log. 10.00000

To the Distance sailed 37° min.

2.57054

So is Sine Compl. of the Course 56° d. 15 m.

9.91985

To the Differ. Latitude 309 min.

22.49039

For the Departure.

As Radius

Log. 10.00000

To the Distance sailed 37° min.

2.57054

So is S. Course 33° d. 45 min.

9.74474

To the Departure 206 min.

22.31528

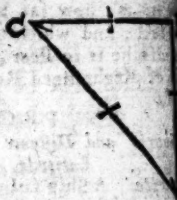
PROB.

Of Plain Sailing.

PROB. II.

The Course and Differ. Latitude being given, to find the Distance and Departure.

Example. A Ship sailing N. W. by N. until her Difference of Latitude be 309 min. I demand her Distance and Departure.



The Operation.

For the Distance.

As S. C. of the Course, 56 d. 15 m.

Log. 9.919

To the Differ. Latitude, 309 min.

2.485

So is Radius

10.000

To the Distance sailed 371 min.

2.570

For the Departure

As Sine Compl. Course 56 d. 15 m.

Co. A Log. 0.080

To the Differ. Latit. 309 min.

2.485

So is S. Course 33 d. 45 m.

9.744

To the Departure 206 m.

2.314

PROB. III.

The Course and Departure given, to find the Distance and Difference of Latitude.

Example. A Ship sailing South East by South, until her Departure be 206 min. I demand the Distance and Difference of Latitude.



The Operation.

For the Distance.

Of Plain Sailing.

29

As S. Course	33 d. 45 m.	Log. 9.74474
To the Departure	206 m.	2.31387
So is Radius		10.00000
To the Distance	370 m.	2.56913

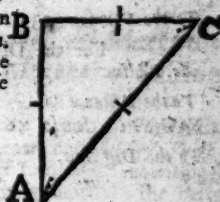
For the Differ. Latitude.

As S. Course	33 d. 45 m.	Co. Ar. Log. 0.25526
To the Departure	206 m.	2.31387
So S.C. Course	56 d. 15 m.	9.91985
To Differ. Latit.	309 m.	2.48898

PROB. IV.

The Difference of Latitude given, to find the Course and Departure.

Example. A Ship sails between the North and the East 372 min. until her Difference of Latitude be 309 min. I demand the Course and Departure.



The Operation.

For the Course.

As the Distance sailed	372 min.	Log. 2.57054
To Radius		10.00000
So is the Differ. Lat.	309 m.	2.48996
To the S.C. Course	33 d. 50 m.	9.91942

For the Departure.

As Radius		Log. 10.00000
To the Distance	372 min.	2.57054
So is the Course	33 d. 50 min.	9.74568
To the Departure	207 min.	2.31622

PROB.

Of Plain Sailing.

P R O B. V.

The Distance and Departure given, to find the Course and Difference of Latitude.

Example. A Ship sails between the South and the West 372 min. until her departure be 206 min. I demand the Course and Diff. Latitude.

The Operation.

For the Course.

As the Distance 372 min.

To Radius

So is the Departure 206 min.

To the Course 33 d. 37 m.

Log. 2.57

10.00

2.57

9.7

For the Difference of Latitude.

As Radius

To the Distance 372 min

So is S. C. Course 56 d. 23 m.

To the Diff. Lat. 309 m.

Log. 10.00

2.57

9.9

12.4

P R O B. VI.

The Difference, Latitude and Departure given, to find Course and Distance.

Example. A Ship sailing between the South and the West until her Differ. Latitude be 309 min. and her Departure 206 min. I demand the Course and Distance.

The Operation.

For the Course.



Of Mercators Sailing.

31

As the Differ. Lat.	309 min.	Lag.	1.48996
To Radius			10.00000
So is Departure	206 m.		2.31387
To T. Course	33 d. 41 m.		9.82391
For the Distance.			
As S. Course	33 d. 41 m.	Lag.	9.74398
To the Departure	206 m.		2.31387
So is Radius			10.00000
To the Distance	371 m.		2.56989

CHAP. V.

Containing Problems of Sailing by Mercators Chart, commonly called Mercators Sailing.

Here it will be necessary to have a Table of Meridional parts, which I have drawn out of Mr. Wrights Tables, to every tenth Minute of Latitude, accounting it in single Miles or Minutes of the Equinoctial, the better to avoid Fractions, as he and Mr. Norwood have designed it, which is inserted towards the end of this Book.

PROB. I.

To find the Meridional Difference of Latitude, or the Difference of Latitude in Meridional Parts.

First, If one place be under the Equinoctial and the other in North or South Latitude, the Meridional parts (in the Table of Meridional parts) answering to the Degrees and Minutes of the place, having Latitude, is the Meridional Diff. Latitude.

Example. One place in the Latitude 37 d. 27 m. North, the

Of Mercators Sailing.

the other under the Equinoctial. I demand the Diff. Latitude in Meridional Parts.

Lat. 37 d. 27 m. ————— 24 26

24 26 is Meridional Diff. Latitude.

Secondly, If two places be both in North, or both South Latitude, subtract the Meridional parts of the Latitude from those of the greater, the Remainder is the Meridional Diff. Latitude.

Example 1.

One place in the Latitude	37 d. 20 m. North	M. parts	241
The other in the Latitude	17 10 North.		109
The Meridional Diff. Latitude			132

Example 2.

One place in the Latitude	45 d. 56 m. South	M. parts	310
The other in the Latitude	29 17 South		199
The Meridional Diff. Latitude			111

Thirdly, If of the two places the one have North Latitude, the other South, add the Meridional parts of each Latitude together, the Sum is the Diff. Latitude in Meridional parts.

Example.

One place in the Latitude	42 d. 17 m. South	M. parts	280
The other in the Latitude	27 19 North		170
The Meridional Diff. Latitude			450

P R O B. II.

Both Latitudes and the Difference of Longitude between any two places being given, to find the Course and Distance.

Example.

Admit the Lizard in the Latitude 50 deg. North, and the Barbadoes in the Latitude 13 deg. 12 min. North, the

Diff.

Difference of Longitude 54 d. 57 m. West, I demand the Course and Distance.

In the Triangle A b c,

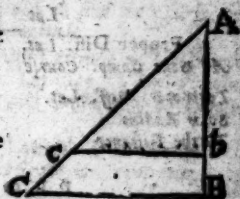
A b represents the proper Difference of Latitude.

b c the Departure.

A c the Distance sailed.

b A c the Course.

A c b the Complement of the Course.



In the Triangle A b c,

A B represents the Meridional Diff. of Latitude.

B C the Difference of Longitude.

B A C the Angle of the Course.

A C B the Complement of the Course.

This being understood, the proportions are the same as in the Doctrine of plain Right angled Triangled Triangles.

The Difference of Longitude reduced to Minutes makes 3296 m.

To find the Meridional Difference of Latitude.

One place in the Latitude 50 d. 00 m. North	M. parts 3474
The other in the Latitude 13 11 North	0799
The Meridional Diff. Latitude	2675

The Operation.

For the Course.

As the Meridional Diff. Lat. 2675 min.	Log. 3.42732
To Radius	10.00000
So is the Diff. Long. 3297 min.	5.51812
To T. Course	50 d. 57 m. 10.09080
The Course is South West, $\frac{1}{2}$ W.	

C

For

Of Mercator Sailing.

For the Distance.

Lat. 50 d. 00 m.

Lat. 13 34

Proper Diff. Lat. 36 48 which is 1208 min.

At Sine Comp. Course 39 03 Log. 9.79934

To proper Diff. Lat. 1208 min. 3.54400

So is Radius 10.00000

To the Distance 3505 m. 3.54466

P R O B. III.

Bob Latitudes and the Course given, to find the Distance and Difference of Longitude.

Example. A Ship sails from the Lizard, in the Longitude 50 deg. North, until she be in the Latitude 13 deg. 12 min. North, her Course South West 50 deg. 57 min. or S. W. 1/2 W. somewhat Westerly, I demand the Distance and Difference of Longitude.

The proper Diff Latitude is 1208 min.

The Meridional Diff. Lat. is 1675 min.

The Operation.

For the Distance.

At Sine Comp. Course 39 d. 03 m. Log. 9.79934

To the Diff. Lat. 1208 m. 3.54400

So is Radius 10.00000

To the Distance 3505 m. 3.54466

For the Difference of Longitude.

At Radius Log. 10.00000

To Meridional Diff. of Lat. 1675 min. 3.42733

So is T. Course 50 d. 57 m. 10.59088

To Difference of Longitude 3197 m. 3.51818

P R O B.

PROB. IV.

Both Latitudes, and the Distance given, to find the Course and Difference of Longitude.

Example. A Ship sails from the Latitude 50 deg. North 3505 min. until she be in the Latitude 13 deg. 12 min. North; I demand the Course and Difference of Longitude.

The Meridional Difference of Latitude is 1675 min.
The proper Difference of Latitude is 1208 min.

The Operation.

For the Course.

As the Distance	3505 min.	Log. 3.54469
To Radius		10.00000
So is the Difference of Latitude: 1208 min.		3.94400
To Sine Comp. Course	39 d. 03 min.	9.79931

For the Difference of Longitude.

As Radius		Log. 10.00000
To the Merid. Diff. Lat. 1675 min.		3.42732
So is T. Course 50 d. 57 m.		10.09086
To Differ. of Longitude 3297 m.		3.51818

PROB. V.

One Latitude, the Course and Difference of Longitude being given, to find the other Latitude, and the Distance.

Example. A Ship sails S. W. 50 deg. 57 min. or S. W. $\frac{1}{2}$ W. somewhat more westerly from the Latitude 50 deg. North, until the Difference of Longitude be 3297 min. I demand the other Latitude and Distance.

The Operation.

For the other Latitude.

C 2

As *T. Course* 50 d. 57 m. *Log.* 10.090

To *Difference of Longitude* 3197 min. 3.311

So is *Radius* 10.000

To the *Merid. Diff. Lat.* 2675 m. 3.427

The *Meridional parts* answering to Lat. 50 d. N. are 3437

From which subtract 2675

There remains 762

Against which in the Table of Merid. parts is Lat. 13 d. 40 m. which is the Latitude of the place North.

For the Distance.

The proper *Difference of Latitude* is 2208 min.

As *Sine Comp. Course* 39 d. 03 m. *Log.* 9.799

To the *Diff. of Latitude* 2208 min. 3.344

So is *Radius* 10.000

To the *Distance* 3505 min. 3.544

PROB. VI.

One Latitude, the Course and Distance given, to find the other Latitude and Difference of Longitude.

Example. A Ship being in the Latitude 50 d. North, sails S. W. 50 deg. 57 min. or S. W. $\frac{1}{2}$ W. and somewhat westerly 3505 m. I demand the other Latitude and Difference of Longitude.

The Operation.

For the Difference of Latitude.

As *Radius* *Log.* 10.0000

To the *Distance* 3505 min. 3.5440

So is *S. C. Course* 39 d. 03 m. 9.7993

To the *Diff. of Latitude* 2208 m. 3.3440

The other Lat. is 13 deg. 12 min. North.

The *Meridional Diff. Lat.* is 2675.

For the Difference of Longitude.

<i>As Radius</i>	<i>Log.</i> 10.00000
<i>To the Meridional Diff. Lat.</i> 2675 min.	3.42732
<i>So is T. Course</i> 50 deg. 57 min.	10.09086
<i>To the Difference of Longitude</i> 3297 min.	23.51818

PROB. VII.

Two Places both in one Parallel, or Latitude, and their Difference of Longitude being given, to find the Distance between them.

Example, Suppose two places both in the Parallel or Latitude of 50 deg. and their Difference of Longitude 70 deg. I demand the Distance between them.

The Operation.

The Difference of Longitude in Minutes is 4200	
<i>As Radius</i>	<i>Log.</i> 10.00000
<i>To Diff. Longitude</i> 4200 min.	3.62325
<i>So is S. C. Latitude</i> 40 d.	9.80807
<i>To the Distance</i> 2700 min.	3.43132

PROB. VIII.

Two places both one in Latitude, and their Distance given, to find their Difference of Longitude.

Example. Suppose two places both in the Latitude 50 d. and the Distance between 2700 min. I demand the Difference of Longitude.

The Operation.

<i>As S. C. Latitude</i> 40 deg.	<i>Log.</i> 9.80807
<i>To the Distance</i> 2700 min.	3.43132
<i>So is the Radius</i>	10.00000
<i>To the Diff. Long.</i> 4200 min.	3.62325

Of Great Circle Sailing.

PROB. IX.

Two places situate both in one Parallel or Latitude, their Distance and Difference of Longitude being given, to find the Parallel or Latitude.

Example. A Ship sailing due West, 2700 min. alters her Diff. Longitude 4200 min. I demand what Latitude the Ship sails in.

The Operation.

As Diff. Longitude 4200 m.

Log. 3.6532

To Radius

10.0000

As the Distance 2700 m.

3.4273

To S. C. Latitude 40 d.

9.8041

CHAP V.

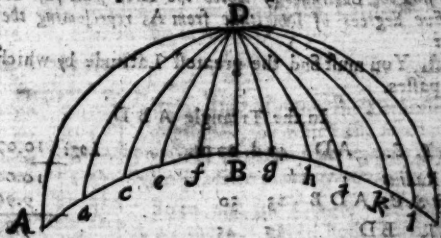
Shewing to Sail by the Arch of a Great Circle, commonly called Great Circle Sailing.

THIS though in some sense it is the most exact way of sailing, shewing the nearest way and distance between any two places; yet it is very difficult, and not so much used as the two former kinds of sailing; for Seamen do seldom keep their Course near this Arch, but are either drawn aside from it by some conveniencies of Winds and Streams, as in sailing to the *West-Indies*, they hale away more to the Southward; or else they are forced from the Course by cross Winds, or interposition of some Head-Lands or Islands: So that their best way is to keep their Account by the former Rules. Only having skill herein they may see that it is many times the nearer way to leave the Rumb, and to sail more Northerly, as in sailing home from

from the *West-Indies*; which makes those that keep not a true account by the former Rules, but reckon altogether by the plain Chart, to be at the *Lands-end* many leagues before their account. Also in a parallel Course, as from the *Lands-end* to *New-found-Land*, you may see how you may advantage your selves by raising and depressing the Pole 10 or 12 deg, which will be a great help for the keeping your account, and yet go a nearer way than if you should sail in the parallel of East and West.

Example. A Ship being in the Latitude 50 deg. North, is bound to a Port in the same parallel, whose Difference of Longitude westerly is 47 deg. I demand the Angles of Position, the Distance in the Arch of a great Circle, by what Latitudes and Longitudes the Arch shall pass, likewise the Course and Distance from place to place according to *Mercator*.

Let A represent the first place, E the second



The Operation.

To find the Angles of Position BAD and BED.

The oblique-angled Triangle ADE is reduced into two equal right-angled Triangles ABD and EBD, the Side and Angles being equal; therefore in either of them there is given the Hypotenuse, and the Angle at D, to find the Angle at A or E.

Of Great Circle Sailing.

In the Triangle A B D.

As T. C. A D B, 23 d. 30 m.

Log. 10.389

To Radius

10.000

S. & S. C. A D 40 00

9.801

To T. C. B A D 71 35

9.541

2. To find the Distance A E.

In the Triangle A B D.

As Radius

Log. 10.000

To S. D A 40 d. 00 m.

9.801

So S. A D B 23 30

9.600

To S. A B 14 51

9.401

A B 14 d. 51 m. being doubled produces

A E 29 43 or 1762 min.

3. To find the Latitudes by which the Arch shall pass at every five degrees of Longitude from A, representing the Port.

First, You must find the greatest Latitude by which the Arch passes.

In the Triangle A B D.

As T. C. A D 40 d. 00 m.

Log. 10.0761

To Radius

10.0000

So S. C. A D B 23 30

9.9614

To T. B D 37 45

9.8361

The Complement of B D (to 90 d.) 52 d. 25 m. is the greatest Latitude.

Secondly, To find the Latitude by which the Arch passes at every five Degrees of Longitude from A, you must resolve the several Right-angled Triangles F D a, B D c, &c.

Subtra

Subtracting five deg. from A D B 23 d. 30 m.

There remains a D B 18 30

Subtracting five deg. from 18 30

Remains B D c 13 30

And so for the rest, as follows in the Table.

	deg.	min.	
a D B	18	30	In the Triangle a B D To find by what Latitude the Point (a) passes.
B D c	13	30	
B D e	08	30	As Radius
B D f	03	30	
B D g	01	30	Log 10.00000
B D h	06	30	
B D i	11	30	To F.C. B D 37 d. 35 m. 10.11371
B D k	16	30	So & S.C. a D B 18 30 9.97696
B D l	21	30	To T.C. D a 39 03 10.09067

The Complement of D a 50 d. 56 m. North is the Latitude of the Point (a).

After the same manner are found the Latitudes for the Points c, e, &c. in the subsequent Table.

Long.	Lat.	
d. m.	d. m.	
A 00 00	50 00	Fourthly, Having the Latitudes and Longitudes, by which the Arch passes, you may find the Course and Distance from place to place by Mercator.
a 05 00	50 57	
c 10 00	51 39	So to find the Course and Distance A a, there is given both Latitudes 50 deg. North, and 50 deg. 57 min. North.
e 15 00	52 07	
f 20 00	52 22	And the Difference of Longitude, five deg. West.
g 25 00	52 24	
h 30 00	52 14	
i 35 00	51 51	
k 40 00	51 15	
l 45 00	50 24	
B 47 00	50 00	

The Meridional Difference of Latitude is 90 min.

For the Course.

Of Great Circle Sailing.

As Merid. Diff. Lat. 90 min. Log. 9.95428

To Radim 10.00000

So is the Diff. of Long. 890 m. 1.94771

To T. Course 73 d. 18. m. 19.10201

For the Distance.

As S. C. 16 d. 43 m. Log. 9.46428

To the Difference of Latitude 57 m. 1.77015

So is Radim 10.00000

To the Distance 193 m. 2.28771

After the same manner you will find the Courses & Distances ac, ce, &c. as they follow in the Table.

Places.	Courses.	Distance.
From A to a	N. W. 73 deg. 18 m.	192
from a to c	N. W. 77 24	191
from c to e	N. W. 81 28	189
from e to f	N. W. 85 14	180
from f to g	N. W. 89 25	196
from g to h	S. W. 86 36	187
from h to i	S. W. 81 47	181
from i to k	S. W. 79 03	189
from k to l	S. W. 75 04	198
from l to B	S. W. 71 25	79

But in regard most of the Courses afore found are so near the West, you may sail W. N. W. 91 1/2 min. until you are in the Latitude 55 d. 50 m. North, and then W. S. W. 91 1/2 min. farther you will arrive at your Port. By the mean

means you will alter your Latitude almost six deg. which is considerable, in respect of the benefit of Observation, besides the Distance is but 44 min. more than that of a great Circle, and not above 13 min. more than the Parallel, or West Distance.

If you desire to perform this or other Problems of Great Circle Sailing by the plain Scale, you may see it largely treated of, *The Geometrical Seaman* being lately enlarged, and made more practical, for the ready keeping your Accounts by Latitude and Longitude, by New Tables for that purpose,

CHAP. VI.

Containing many Astronomical Problems very useful in the Art of Navigation: illustrated by the general Scheme annexed pag. 46.

Of Astronomical Definitions.

THE Poles of the World are two fixed Points in the Heavens, diametrically opposite to one another, the one visible in our Hemisphere, called the North or Arctick Pole, noted with the Letter P: the other not seen of us, being in the lower Hemisphere, called the South or Antarctick Pole, noted with S.

The Axis of the World is an imaginary Line drawn from Pole to Pole, about which the Diurnal motion is performed from East to West; represented by P & S.

The Meridians are great Circles concurring and intersecting one another in the Poles of the World, as P & S, and P & S.

The Equinoctial, or Equator, is a great Circle, 90 deg. distant from the Poles of the World, cutting the Meridians at

44 Of Astronomical Problems.

at Right-angles, and dividing the World into two parts called the North and South Hemispheres; as $H \text{ --- } K$.

The Ecliptick is a great Circle crossing the Equinoctial in the two opposite Points *Aries* and *Libra*, and making an Angle therewith (called its Obliquity) of $23 \text{ deg. } 30 \text{ min.}$

This Circle is divided into 12 Signs, each containing 30 deg. whose Names and Characters follow.

<i>Aries</i> ♈	Which are called Northern Signs.	<i>Libra</i> ♎	These are called Southern Signs.
<i>Taurus</i> ♉		<i>Scorpio</i> ♏	
<i>Gemini</i> ♊		<i>Sagittarius</i> ♐	
<i>Cancer</i> ♋		<i>Capricorn</i> ♑	
<i>Leo</i> ♌		<i>Aquarius</i> ♒	
<i>Virgo</i> ♍		<i>Pisces</i> ♓	

The Ecliptick is represented by $S \text{ --- } W$.

The Zodiack is a Zone having eight deg. of Latitude on either side of the Ecliptick, in which space the Planets make their Revolutions. It is divided and distinguished by the twelve Signs.

The Colures are two Meridians, dividing the Equinoctial and the Ecliptick into four equal parts, one of these pass by the Equinoctial Points, *Aries* and *Libra*, and is called the Equinoctial Colure, as $P \text{ --- } S$: the other by the beginnings of *Cancer* and *Capricorn*, called the Solstitial Colure, $P \text{ --- } W$.

The Poles of the Ecliptick are two Points $23 \text{ deg. } 30 \text{ min.}$ distant from the Poles of the World; as I and K .

The Tropicks are two small Circles parallel to the Equinoctial, and distant therefrom $23 \text{ d. } 30 \text{ m.}$ limiting the Sun's greatest Declination.

The Northern Tropic passeth by the beginning of *Cancer*, and is called the Tropic of *Cancer*; as $S \text{ --- } D$.

The Southern Tropic passeth by the beginning of *Capricorn*, and is called the Tropic of *Capricorn*; as $A \text{ --- } W$.

The Polar Circles are two small Circles parallel to the Equinoctial, and distant therefrom $66 \text{ d. } 30 \text{ m.}$ and from the Poles of the World $23 \text{ d. } 30 \text{ m.}$

Th

That which is adjacent to the North Pole is called the Arctick Circle, as G d J : and the other the Antarctick Circle, as K d M.

The Zenith and Nadir are two Points diametrically opposite : The Zenith is the Vertical Point, or the Point right over our Heads, as Z ; the Nadir is directly opposite thereto, as N.

The Azimuths, or Vertical Circles, are great Circles of the Sphere, concurring and intersecting each other in the Zenith and Nadir, as Z f N.

The Horizon is a great Circle 90 deg. distant from the Zenith and Nadir, cutting all Azimuths at Right angles, and dividing the World into two equal parts, the upper and visible Hemisphere, and the lower and invisible : This Circle is represented by H m R.

The Meridian of a place is that Meridian which passes by the Zenith and Nadir of the place ; as P Z S N.

The Almicanthars, or parallels of Altitude, are small Circles, parallel to the Horizon, imagined to pass through every Degree and Minute of the Meridian, between the Zenith and Horizon ; as B a E.

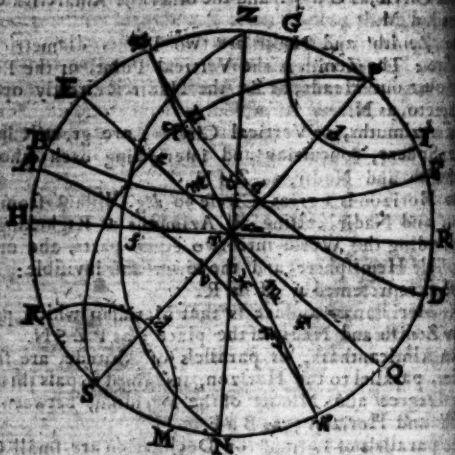
The parallels of Latitude or Declination are small Circles parallel to the Equinoctial : they are called parallels of Declination in the Heavens when applyed to the Sun or Stars ; but on the Earth are called parallels of Latitude.

The Latitude of a place is the Height of the Pole above the Horizon, or the Distance between the Zenith and the Equinoctial.

The Latitude of a Star is the Arch of a Circle contained between the Center of a Star and the Ecliptick Line, this Circle making right Angles with the Ecliptick, and is counted either Northward or Southward, according to the Situation of the Star.

Longitude on the Earth is measured by an Arch of the Equinoctial, contained between the primary or first Meridian of that place where the Longitude is assigned to begin, and the Meridian of any other place, counted always easterly.

The



The Longitude of a Star, is that part of the Ecliptick, which is contained between the Stars place in the Ecliptick, and the beginning of Aries, counting them according to the Succession of the Signs.

Altitude of the Sun or Stars Is the Arch of an Azimuth contained between the Center of the Sun or Star and the Horizon.

Ascension is the rising of any Star, or any part of the Ecliptick, above the Horizon, and Descension is the setting thereof.

Right Ascension is the number of Degrees and Minutes of the Equinoctial (counted from the beginning of Aries) which cometh to the Meridian with the Sun or Stars, with any portion of the Ecliptick.

Oblige

Oblige
ween
al th
on or
Oblige
Asce
e Ri
The
Sett
Horiz

As
To
the n
So
To

As
To
So
next
To

As
To
So
T
W
shew

Oblique Ascension is an Arch of the Equinoctial between the beginning of *Aries* and that part of the Equinoctial that riseth with the Center of a Star, or with any portion of the Ecliptick, in an oblique Sphere.

Oblique Descension is that part which sets throwith, Ascensional Difference is an Arch of Difference between the Right and Oblique Ascension.

The Amplitude of the Sun is the Distance of the rising or Setting thereof, from the East and West Points of the Horizon.

PROPOSITION I.

To find the Suns Declination at any time.

As Radius or Sine 90 deg.

To Sine of the Distance or Longitude of the Sun from the next Equinoctial Point;

So is the Sine of the Suns greatest Declination

To the Sine of the Suns present Declination.

PROP. II.

To find the Suns Right Ascension.

As the Radius

To the Sine of the Complement of the Suns greatest Declination:

So the Tangent of the Longitude of the Sun from the next Equinoctial Point,

To the Tangent of the Right Ascension of the Sun from the same Equinoctial Point.

PROP. III.

To find the Suns Ascensional Difference.

As the Radius

To the Tangent of the Poles height:

So the Tangent of the Suns Declination;

To the Sine of the Suns Ascensional Difference.

Which added to, or subtracted from the Hour of Six; shews the Suns rising and setting.

PROP.

PROP. IV.

To find the Suns Amplitude.

As the Sine Complement of the Poles height,

To the Sine of the Suns Declination :

So the Radius

To the Sine of the Suns Amplitude.

PROP. V.

*To find the Suns Horary Distance from the Meridian when
is due East or West.*

As the Tangent of the Poles height,

Is to the Radius :

So the Tangent of the Suns Declination ;

To the Sine of the Suns Horary Distance from the Meridian, being just East or West.

PROP. VI.

To find the Altitude of the Sun being just East or West.

As the Sine of the Poles height,

Is to the Radius :

So the Sine of the Suns Declination,

To the Sine of the Suns height being just East or West.

PROP. VII.

To find the Suns Altitude at the Hour of Six.

As the Radius,

To the Sine of the Poles height :

So the Sine of the Suns Declination ;

To the Sine of the Suns height at the hour of six.

PROP. VIII.

To find the Suns Azimuth at the Hour of Six.

As the Radius,

To the Cosine of the Poles Height :

So the Tangent of the Suns Declination,

To the Tangent of the Suns Azimuth from the North part of the Meridian at the hour six.

P R O P. IX.

To find the Suns Altitude at any time of the day.

As the Radius,

To the Cotangent of the Poles height:

So is the Sine of the Suns Distance from the hour of six,

To the Tangent of an Arch.

Which being subtracted out of the Suns Distance from the Pole, work again thus.

As the Cosine of the Arch found,

To the Cosine of the remaining Arch of the Suns Distance from the Pole:

So is the Sine of the Poles height,

To the Sine of the Suns Altitude at the hour required.

P R O P. X.

To find the Hour of the Day by the height of the Sun.

Take the Complement of the Suns height, the Complement of the Latitude of the place, and the Complement of the Declination of the Sun, and add these three sides together, and find the Difference between their half Sum, and the Suns Altitude, Then work thus,

1. As the Radius to the Cosine of the Latitude:

So the Sine of the Suns Distance from the Pole, to a 4th Sine.

2. As that fourth Sine, to the Sine of half the Sum:

So the Sine of the Difference, to a seventh Sine.

Unto which if you add the Radius, half that Sum will be the Sine of an Arch, whose Complement being doubled, will be the Distance of the Sun from the Meridian, which converted into Time will shew the Hour of the Day.

P R O P. IX.

To find the Azimuth by the Suns Height.

Take the Complement of the Suns Declination, the Complement of the Latitude, and the Complement of the

D

Suns

Of Astronomical Problems.

Suns Height, and add these three sides together; and in their Difference between their half Sum, and the Distance from the Pole, only put the Suns Distance from the Pole first. Then work thus.

1. As the Radius,

To the Cosine of the Latitude.

So the Cosine of the Suns Height,

To a fourth Sine.

2. As that fourth Sine,

To the Sine of half the Sum:

So the Sine of the Difference

To a seventh Sine.

Unto which if you add the Radius, half that Sum will be the Sine of an Arch, whose Complement being doubled, is the Azimuth desired.

PROP. XII.

Having the Angle of the Azimuth, to find the Hour.

As the Sine Complement of the Suns Declination,

To the Sine of the Suns Azimuth:

So the Sine Complement of the Suns Height,

To the Sine of the Suns Horary Distance from the Meridian.

PROP. XIII.

Having the Longitude and Latitude of any Star, to find the Right Ascension and Declination thereof.

1. As the Radius,

To the Sine of the Stars Longitude from the next Equinoctial Point:

So the Cotangent of the Stars Latitude,

To the Tangent of a fourth Arch.

Compare this fourth Arch with the Arch of Distance between the Poles of the World and the Ecliptick, 23 deg. 30 min. and if the Latitude and Longitude of the Star be both

both of one quality, that is, when the Star hath North Latitude in the six Northern Signs γ δ Π Φ Λ Υ , or South Latitude in the six Southern Signs φ μ π ψ ω χ , then shall the Difference between this fourth Arch, and the Distance of the Poles $23 \text{ deg. } 30 \text{ min.}$ be your fifth Arch.

But if the Longitude and Latitude of the Star be of contrary qualities, that is, one Northern and the other Southern, then add this fourth Arch to the Distance of the Poles $23 \text{ deg. } 30 \text{ min.}$ and the Sum thereof shall be your fifth Arch; with which proceed.

2. As the Sine of the fourth Arch,
To the Sine of the fifth Arch;
So the Tangent of the Stars Longitude,
To the Tangent of the Stars Right Ascension from the next Equinoctial Point.

3. As the Cosine of the fourth Arch,
To the Cosine of the fifth Arch;
So the Sine of the Stars Latitude,
To the Sine of the Stars Declination.

Lastly, for Proof of your Work.

4. As the Cosine of the Stars Latitude,
To the Cosine of the Stars Right Ascension;
So the Cosine of the Declination,
To the Cosine of the Longitude.

And thus having found the Right Ascension and Declination of any Star, you may by the former Rules find its Amplitude, its Difference of Ascension, its Distance from the Meridian at any height observed, and so the Hour of the Night thereby, having first the time of its coming to the South, by subtracting its Right Ascension from the Right Ascension of the Sun.

CHAP. VII.

Containing Problems of Geography.

PROPOSITION I.

To find the Distance of any two places which differ only in Latitude, being both upon the same Meridian.

1. IF the two places are upon the same side of the Equinoctial: subtract the lesser Latitude out of the greater, the Remainder is the Distance required.

2. If the one place be on the one side of the Equinoctial and the other on the other: Add the two Latitudes together, and the Sum is the Distance required.

P R O P. II.

To know the Distance of any two places which differ only in Longitude.

1. If the places are both of them under the Equinoctial, subtract the lesser Longitude out of the greater, the Remainder is the Distance.

2. If the two places have the same Latitude, and so under the same parallel, then,

As the Radius,

To the Cosine of their Latitude:

So the Sine of half their Difference of Longitude,

To the Sine of half their Distance.

P R O P. III.

To find the Distance of two places which differ both in Longitude and Latitude.

This Proposition hath three Cases.

CASE I.

When one place is under the Equinoctial, and the other toward either of the Poles, Then,

*As the Radius,
To the Cosine of their Difference of Longitude :
So the Cosine of their Latitude ,
To the Cosine of their Distance.*

CASE II.

When both places are towards one of the Poles. First,

*As the Radius,
To the Cosine of the Difference of Longitude :
So the Cotangent of the lesser Latitude,
To the Tangent of a fourth Arch.*

Which being subtracted out of the Complement of the greater Latitude, the Remainder must be your fifth Arch :
Then,

*As the Cosine of the fourth Arch,
To the Cosine of the fifth Arch :
So the Sine of the lesser Latitude ,
To the Cosine of the Distance required.*

CASE III.

When one place is toward the North Pole, and the other toward the South Pole : First,

*As the Radius,
To the Cosine of their Difference of Longitude :
So the Cotangent of one of the Latitudes,
To the Tangent of a fourth Arch.*

Which being subtracted out of the other Latitude, having 90 deg. added to it, the Remainder is the fifth Arch.
Then,

*As the Cosine of the fourth Arch,
To the Cosine of the fifth Arch :
So the Sine of the Latitude first taken,
To the Cosine of their Distance.*

By these Rules, also you may find the Distance of any two Stars, if you know their Longitude and Latitude, or their Right Ascension and Declination, which is of good use in Astronomy.

How to find the Variation of the Compass.

BY the fourth Proposition of the sixth Chapter you may find the Suns Amplitude by Calculation, which I call the true Amplitude, and by the Amplitude Compass you may observe the Suns Amplitude either at Sun-Rising or Setting, which I call the Magnetical (or Compass) Amplitude. If these two Amplitudes agree (which is very seldom,) there is no Variation, but if they do not agree, the Difference between them being rightly accounted, is the Variation of the Compass.

Likewise by the eleventh Proposition of the sixth Chapter you may find the Suns Azimuth by calculation, which I call the true Azimuth, and by the Azimuth Compass you may observe the Suns Azimuth, either in the Forenoon or Afternoon the Sun about 10 or 15 d. high, and this I call the Magnetical Azimuth.

Note, you may see the use of the Azimuth Compass, in observing the Magnetical Azimuth or Amplitude, in a useful Treatise called Practical Navigation, p. 114.

Example.

Suppose the true Amplitude be East 32 d. Northerly, and the Magnetical Amplitude East 17 d. Northerly, the Difference is 5 d. which is the Variation, almost half a Point of the Compass.

Suppose

Suppose the true Azimuth to be West 12 d. 30 m. Southerly, and the Magnetical to be West 14 d. 30 m. Northerly; 12 d. 30 m. added to 14 d. 30 min. the one being Northerly and the other Southerly, make the Difference between the Azimuths to be 27 d. and that is the Variation almost two points $\frac{1}{2}$ of the Compass.

To find which way the Compass varies.

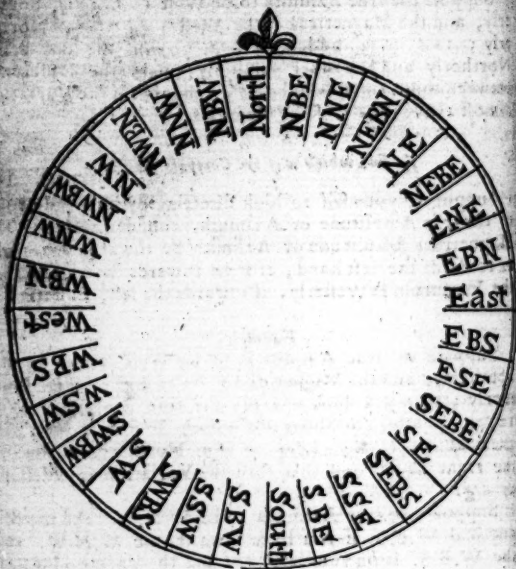
Supposing your self to look directly towards the Coast of the true Amplitude or Azimuth, consider whether the Magnetical Amplitude or Azimuth be towards the right or towards the left hand; if it be towards the right hand, the Variation is Westerly, if towards the left, Easterly.

Example.

Suppose the true Amplitude to be West 12 deg. 30 min. Southerly, and the Magnetical to be 14 deg. 30 min. Northerly; then if I look towards the true Amplitude West 12 deg. 30 min. (or about one point) Southerly, the Magnetical Amplitude 14 deg. 30 min. Northerly is towards the right hand, and therefore the Variation is Westerly 27 deg.

Suppose the true Azimuth to be W.N.W. and the Magnetical W.B.S. if you look towards the W.N.W. then the W.B.S. is on your left hand and the Variation is Easterly three Points.

But this Proposition may be performed most readily by the following Instrument which may be called the Rectifier, the Description whereof is here inserted.



This represents two Compasses, the one fixed, the other moveable, the fixed Compass may represent the Horizon, in the which the North Point and all the other Points of the Compass are fixed and immoveable. The moveable one represents the Mariners Compass, in which the North Point and consequently the other Points are liable to Variation; and if the North Point of the Mariners Compass lie to the Eastward of the true North in the Horizon, the Variation is Easterly; if it lie to the Westward, the Variation is Westerly.

Example,

Example.

Suppose the true Azimuth be (as before) W.N.W. and the Magnetical W.B.S. Place the W.B.S. Point of the moveable Compass to the W.N.W. Point of the immoveable, then the North Point of the moveable Compass stands at the N.E.B.N. Point of the immoveable, which shews the Variation is three Points Easterly as before.

Suppose the true Amplitude be S.W. and the Magnetical W.S.W. Place the W.S.W. Point of the moveable Compass to the S.W. Point of the immoveable Compass, then shall the North Point of the moveable stand at the N.N.W. Point of the immoveable, which shews that the Variation is two Points Westerly.

How to rectifie your Course when the Compass varies.

This may be very readily performed by the foregoing Instrument.

Example.

Suppose the Variation be 2 Points Easterly, and the Course by the Compass is S.W.B.S. to find the true Course the Variation being allowed.

Place the North Point of the moveable Compass, to the N.N.E. Point of the immoveable, because the Variation is 2 Points Easterly, then the S.W.B.S. Point of the moveable Compass will stand at the S.W.B.W. Point of the immoveable, which is the true Course required.

Course that I should steer is S.E.B.S. but the Compass varies 2 Points and an half Westerly, what Course must I steer to allow the Variation?

Place the North Point of the moveable Compass to N.N.W. $\frac{1}{2}$ W. on the immoveable, then right against S.E.B.E. the true Course on the immoveable, stands S.S.E. $\frac{1}{2}$ E. on the moveable Compass, which is the Course you must steer to allow for the Variation of the Compass.

If

IF any thing seem obscure in this small Treatise, it being only an Epitome of Navigation, we refer the Reader to a Book lately printed, Entitled *Practical Navigation*, where he may receive ample Satisfaction; and likewise see the Use of most Instruments in Navigation.

IN Marsh Yard a little below the Hermitage-Stairs in Wapping, are taught the *Mathematical Sciences*, viz. Arithmetick, Geometry, Algebra, Trigonometry, Navigation, Astronomy, Surveying, Gauging, Dialling, *the Use of the Globes and other Mathematical Instruments*, Projection of the Sphere and other parts of the Mathematicks,

By *John Colson*

Several Necessary
T A B L E S
Appertaining to
Navigation,

With their Uses briefly Explained
in the Order following:

- I. A Table of Meridional Parts.
- II. A Table of the Suns right Ascension.
- III. A Table of the right Ascensions and Declinations of the principal fixed Stars.
- IV. A Table of the Suns Declination newly calculated.
- V. A Table of the Latitudes and Longitudes of the principal Ports, Harbours, Capes and Islands in the World.
- VI. A Table of Difference of Latitude and Departure for the exact working a Traverse.
- VII. A Table shewing the first day of *March*, Epact, Dominical Letter, &c. with a perpetual Almanack.
- VIII. A Table of the Angles which every Rumb (or Point of the Compass) maketh with the Meridian.
- IX. A Table of Sines and Tangents to every Degree and Minute of the Quadrant.
- X. A Table of Logarithms increasing from one to two thousand, carefully Corrected and exactly Printed.

L O N D O N: Printed for *W. Fisher*, 1674.

Deg. of Lat.	A Table of Meridional Miles.						Difference
	The Minutes of each Degree.						
	0	10	20	30	40	50	
	The Meridional Miles.						
0	0	10	20	30	40	50	10
1	60	70	80	90	100	110	10
2	120	130	140	150	160	170	10
3	180	190	200	210	220	230	10
4	240	250	260	270	280	290	10
5	300	310	320	330	340	350	10
6	360	370	380	390	400	410	10
7	421	431	441	451	461	471	10
8	481	491	501	511	521	532	10
9	542	552	562	572	582	592	10
10	603	613	623	633	643	653	10
11	664	674	684	694	704	715	10
12	725	735	745	755	766	776	10
13	786	797	807	817	827	838	10
14	848	858	869	879	889	900	10
15	910	920	931	941	951	962	10
16	972	983	993	1004	1014	1024	10
17	1035	1045	1056	1066	1077	1087	10
18	1098	1108	1119	1129	1140	1150	10
19	1161	1172	1182	1193	1203	1214	10
20	1225	1235	1246	1257	1267	1278	11
21	1289	1299	1310	1321	1332	1342	11
22	1353	1364	1375	1386	1396	1407	11
23	1418	1429	1440	1451	1462	1473	11
24	1484	1499	1505	1516	1527	1538	11
25	1549	1561	1572	1583	1594	1605	11
26	1616	1627	1638	1649	1661	1672	11
27	1683	1694	1705	1717	1728	1738	11
28	1751	1762	1773	1785	1796	1808	11
29	1819	1830	1842	1853	1865	1877	11

Deg. of Lat.	A Table of Meridional Miles.						Difference
	The Minutes of each Degree.						
	0	10	20	30	40	50	
	The Meridional Miles.						
30	1888	1899	1911	1923	1934	1946	12
31	1958	1969	1981	1993	2004	2016	12
32	2028	2040	2052	2063	2075	2087	12
33	2099	2111	2123	2135	2147	2159	12
34	2171	2183	2195	2207	2219	2231	12
35	2244	2256	2268	2281	2293	2305	12
36	2318	2330	2342	2355	2367	2380	12
37	2392	2405	2417	2430	2442	2455	12
38	2468	2481	2493	2506	2519	2532	13
39	2544	2557	2570	2583	2596	2609	13
40	2622	2635	2648	2662	2675	2688	13
41	2701	2714	2728	2741	2754	2768	13
42	2781	2795	2808	2822	2835	2849	13
43	2863	2876	2890	2904	2918	2932	14
44	2945	2959	2973	2987	3001	3015	14
45	3030	3044	3058	3072	3086	3101	14
46	3115	3130	3144	3159	3173	3188	14
47	3202	3217	3232	3247	3261	3276	15
48	3291	3306	3321	3336	3351	3366	15
49	3382	3397	3412	3428	3443	3459	15
50	3474	3490	3505	3521	3537	3553	16
51	3568	3584	3600	3616	3632	3649	16
52	3665	3681	3697	3714	3730	3747	16
53	3763	3780	3797	3814	3830	3847	17
54	3864	3881	3899	3916	3933	3950	17
55	3968	3985	4003	4020	4038	4056	18
56	4074	4092	4110	4128	4146	4164	18
57	4182	4201	4219	4238	4257	4275	19
58	4294	4313	4332	4351	4370	4390	20
59	4409	4428	4448	4468	4487	4507	20

Difference
12
12
12
12
12
12
13
13
13
13
14
14
4
4
5
5
5
6
6
6
7
7
8
9

Deg. of Lat.

A Table of Meridional Miles.

The Minutes of each Degree.

0 | 10 | 20 | 30 | 40 | 50

The Meridional Miles.

Difference

60	4527	4547	4567	4588	4608	4629	20
61	4648	4670	4691	4711	4733	4754	21
62	4775	4796	4818	4839	4861	4883	22
63	4905	4927	4949	4972	4994	5017	23
64	5039	5062	5085	5108	5132	5155	23
65	5179	5203	5226	5250	5275	5299	24
66	5324	5348	5373	5390	5423	5449	25
67	5474	5500	5520	5552	5678	5404	26
68	5631	5658	5685	5712	5739	5767	27
69	5795	5823	5851	5879	5908	5937	28
70	5966	5996	6025	6055	6085	6115	30
71	6146	6177	6208	6239	6271	6303	31
72	6335	6368	6401	6434	6468	6501	33
73	6535	6570	6605	6640	6675	6718	35
74	6747	6783	6820	6857	6895	6933	37
75	6972	7010	7050	7089	7130	7170	40
76	7211	7253	7295	7338	7381	7424	43
77	7469	7513	7559	7605	7651	7698	46
78	7746	7795	7844	7894	7944	7996	50
79	8048	8100	8154	8209	8264	8320	55
80	8377	8435	8495	8555	8616	8678	60
81	8742	8806	8872	8939	9007	9077	68
82	9148	9221	9295	9371	9449	9528	77
83	9609	9692	9778	9865	9954	10046	88
84	10141	10238	10338	10441	10547	10656	105
85	10770	10887	11007	11133	11263	11398	128
86	11539	11686	11839	11999	12168	12344	165
87	12521	12718	12927	13150	13388	13644	230
88	13920	14221	14550	14914	15321	15783	386
89	16318	16950	17726	18729	20152	22623	

A Table of Proportional Parts.

D	1	2	3	4	5	6	7	8	9
10	1	2	3	4	5	6	7	8	9
11	1	2	3	4	5	7	8	9	10
12	1	2	4	5	6	7	8	10	11
13	1	3	4	5	7	8	9	10	12
14	1	3	4	6	7	8	10	11	13
15	1	3	4	6	7	9	10	12	13
16	2	3	5	6	8	10	11	13	14
17	2	3	5	7	8	10	12	14	15
18	2	4	5	7	9	11	13	14	16
19	2	4	6	8	9	11	13	15	17
20	2	4	6	8	10	12	14	16	18
21	2	4	6	8	10	13	15	17	19
22	2	4	7	9	10	13	15	18	20
23	2	5	7	9	11	14	16	18	21
24	2	5	7	10	12	14	17	19	22
25	2	5	7	10	12	15	17	20	22
26	3	5	8	10	13	16	18	21	23
27	3	5	8	11	13	16	19	22	24
28	3	6	8	11	14	17	20	22	25
30	3	6	9	12	15	18	21	24	27
33	3	7	10	13	16	20	23	26	30
35	3	7	10	14	17	21	24	28	31
37	4	7	11	15	18	22	26	30	33
40	5	8	12	16	20	24	28	32	36
55	5	11	16	22	27	33	38	44	49
60	6	12	18	24	30	36	42	48	54
68	6	13	20	27	34	40	47	54	61
77	7	15	23	30	38	46	53	61	69
88	8	17	26	35	44	52	61	70	79
105	10	21	31	42	52	63	73	84	94
128	12	25	38	51	64	76	89	102	115
165	16	33	49	66	82	99	115	132	148
230	23	46	69	92	115	138	161	184	207
386	38	77	115	154	193	231	270	308	347

The Use of the Table, &c.

The Use of the Table of Meridional Parts.

THIS Table sheweth the Meridional Parts for any Degree or Minute of Latitude. In the first Column towards the left hand are the Degrees of Latitude, from 1 to 89 d. in the second, third, fourth, fifth, sixth, and seventh Columns, are every 10 Minutes of Latitude, answering to the Degree in the first Column, and are distinguished with 0, 10, 20, 30, 40 and 50 Minutes: In the last Column towards the right hand, are the Differences in Meridional Parts, to every ten Minutes of Latitude: By the help of which and the foregoing Table of Proportional Parts the Meridional Parts may be found to every Minute of Latitude.

Example.

Suppose the Latitude be 17 d. 10 m. to find the Meridional Parts.

Right against 17 d. in the first Column, and under 10 m. in the third Column you will find the Meridional Parts to be 1045.

Suppose you were to find the Meridional Parts answering to the Latitude 74 d. 50 m.

Right against 74 d. in the first Column, and under 50 m. in the seventh Column you will find 6933, which are the Meridional Parts required.

The Use of the Table of Proportional Parts.

THE Use of this Table is to find the Meridional Parts to every Minute of Latitude.

Example.

Suppose it were required to find the Meridional Parts for the Latitude 29 d. 17 m.

E

First,

The Use of the Table, &c.

First, find the Meridional Parts for the Latitude 29 d. 10 m. 10 m. being the next, which is less than 17, which you will find to be 1830; and right against 29 d. in the Column of Difference you will find 11; with this Difference go to the Table of Proportional Parts, and look 11 in the first Column under *D*, which stands for *Difference*, and because 17 m. is 7 more than 10, look under 7 at the top of the eighth Column, is right against 11 and right under 7, you will find 8, which added to 1830, makes 1838 the Meridional Parts required.

Suppose you were required to find the Meridional Parts for the Latitude 45 d. 56 m.

The next less than 56 m. is 50 m. therefore find the Meridional Parts for 45 d. 50 m. which are 3101, and and right againo 45 d. the Difference, in the last Column is 14 d. 56 m. is 6 m. above 50, therefore in the Table of Proportional Parts, right against 14 and under 6 you will find the Proportional Part to be 5, which added to 3101, makes 3106 the Meridional Parts required.

A Table

A Table of the Suns right Ascension.

Days	January		February		March		April		May		June	
	Ascens. H.	M.	Ascens. H.	M.	Ascens. H.	M.	Ascens. H.	M.	Ascens. H.	M.	Ascens. H.	M.
1	19	35	21	42	23	48	1	21	3	14	5	19
2	19	39	21	46	23	52	1	25	3	18	5	23
3	19	43	21	50	23	56	1	29	3	22	5	27
4	19	47	21	54	23	59	1	33	3	26	5	31
5	19	51	21	58	23	43	1	36	3	30	5	36
6	19	56	22	02	23	46	1	40	3	34	5	40
7	20	00	22	06	23	50	1	44	3	38	5	44
8	20	04	22	10	23	53	1	47	3	42	5	48
9	20	09	22	14	23	57	1	51	3	46	5	52
10	20	13	22	17	0	01	1	54	3	50	5	56
11	20	17	22	21	0	05	1	58	3	54	6	00
12	20	22	22	25	0	08	2	02	3	58	6	04
13	20	26	22	29	0	12	2	06	4	02	6	08
14	20	30	22	33	0	15	2	10	4	06	6	12
15	20	34	22	36	0	19	2	13	4	10	6	17
16	20	38	22	40	0	23	2	17	4	14	6	21
17	20	42	22	44	0	26	2	21	4	18	6	25
18	20	46	22	48	0	30	2	25	4	22	6	29
19	20	50	22	52	0	33	2	29	4	26	6	33
20	20	54	22	55	0	37	2	32	4	30	6	38
21	20	58	22	59	0	41	2	36	4	34	6	42
22	21	03	23	03	0	44	2	40	4	38	6	46
23	21	07	23	06	0	48	2	44	4	42	6	50
24	21	11	23	10	0	52	2	48	4	46	6	54
25	21	15	23	13	0	55	2	51	4	50	6	58
26	21	19	23	17	0	59	2	55	4	54	7	02
27	21	23	23	21	1	03	2	59	4	58	7	06
28	21	27	23	25	1	06	3	03	5	02	7	10
29	21	31			1	10	3	07	5	06	7	14
30	21	35			1	14	3	10	5	11	7	19
31	21	38			1	17			5	15		

A Table of the Suns right Ascension.

	July		August		Septemb.		October		Novemb.		Decemb.	
Days.	Ascens.		Ascens.		Ascens.		Ascens.		Ascens.		Ascens.	
	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.
1	7	23	9	25	11	19	13	08	15	07	17	15
2	7	27	9	29	11	23	13	12	15	11	17	20
3	7	31	9	33	11	26	13	15	15	15	17	25
4	7	35	9	37	11	30	13	19	15	19	17	29
5	7	39	9	40	11	33	13	22	15	23	17	34
6	7	43	9	44	11	37	13	26	15	27	17	38
7	7	47	9	48	11	41	13	30	15	31	17	42
8	7	51	9	51	11	44	13	34	15	36	17	47
9	7	55	9	55	11	48	13	38	15	40	17	51
10	7	59	9	58	11	51	13	41	15	45	17	56
11	8	03	10	02	11	55	13	45	15	49	18	00
12	8	07	10	06	11	59	13	49	15	53	18	04
13	8	11	10	10	12	02	13	53	15	58	18	09
14	8	15	10	14	12	06	13	57	16	02	18	14
15	8	19	10	17	12	09	14	00	16	07	18	19
16	8	23	10	21	12	13	14	04	16	11	18	24
17	8	27	10	25	12	17	14	08	16	15	18	28
18	8	31	10	28	12	20	14	12	16	19	18	33
19	8	35	10	32	12	24	14	16	16	23	18	37
20	8	39	10	35	12	27	14	20	16	28	18	41
21	8	43	10	39	12	31	14	24	16	32	18	45
22	8	47	10	43	12	35	14	28	16	36	18	49
23	8	51	10	46	12	38	14	32	16	40	18	54
24	8	55	10	50	12	42	14	36	16	44	18	58
25	8	58	10	53	12	45	14	39	16	49	19	03
26	9	02	10	57	12	49	14	43	16	53	19	07
27	9	06	11	01	12	53	14	47	16	57	19	11
28	9	10	11	04	12	57	14	51	17	02	19	16
29	9	14	11	08	13	01	14	55	17	06	19	20
30	9	17	11	11	13	04	14	59	17	11	19	25
31	9	21	11	15			15	03			19	30

A Table of the right Ascensions and Declinations
of some of the Principal Fixed Stars, for some
years to come.

	Right Ascen.	Declination.	Z. or S.	Magnit.
	H. M.	H. M.		
Pole Star	00 31	87 34	N	2
Andromedas Girdle	00 50	33 50	N	2
Whales Belly	01 35	12 00	S	3
Rams Head	01 48	21 49	N	3
Medusas Head	02 44	02 42	N	2
Whales Moub	02 46	39 35	N	3
Perseus right Side	02 59	48 33	N	2
Bulls Eye	04 16	15 46	N	1
Goat	04 52	45 37	N	1
Orions left Foot	04 58	8 38	S	1
Orions left Shoulder	05 6	5 59	N	3
First in Orions Girdle	05 15	00 35	S	3
Second in Orions Girdle	05 19	1 27	S	3
Third in Orions Girdle	05 23	2 9	S	3
Orions right Shoulder	05 36	7 18	N	2
The Wagoner	05 39	44 56	N	2
Bright Foot of the Twins	6 18	16 39	N	3
Great Dog	06 30	16 13	S	1
Castor	07 12	32 30	N	2
The little Dog	07 22	6 06	N	2
Pollux	07 24	28 28	N	2
Hidras Heart	09 10	07 10	S	1
Lions Heart	09 50	13 39	N	1
Lions Neck	09 50	21 41	N	3
Great Bears Rump	10 40	53 43	N	2
Lions Back	11 30	22 04	N	2
Lions Tail	11 31	16 30	N	1
The Virgins Girdle (Rump	12 38	05 20	N	3
First in the great Bears tail next the	12 38	57 51	N	2

Vindemiatrix	13	48	15	51	N
Virgins Spike	13	07	09	19	S
Middlemost in the great Bears Tail	13	10	56	45	N
Last in the end of great Bears Tail	13	34	51	05	N
Arcturus	14	00	21	03	N
South Balance	14	32	14	33	S
Brightest in the Crown	15	24	27	43	N
North Balance	15	58	08	03	S
Serpentarius's left Hand	15	56	02	46	S
Scorpions Heart	16	03	25	35	S
Serpentarius's left Knee	16	18	09	46	S
Serpentarius's right Knee	16	49	15	12	S
Hercules Head	16	59	14	51	N
Serpentarius's Head	17	19	12	52	N
Dragons Head	17	48	51	36	N
Brightest in the Harp	18	25	38	30	N
The Vulturs Heart	19	34	08	00	N
Upper Horn of Capricorn	19	58	13	32	S
Swans Tail	20	30	44	05	N
Left Shoulder of Aquarius	21	13	07	02	S
Pegasus Mouth	21	27	08	19	N
Right Shoulder of Aquarius	21	48	11	58	S
Fomahant	22	39	31	17	S
Pegasus upper Wing or Marchab	22	48	13	21	N
Pegasus lower Wing	23	55	33	25	N

To know the Hour when any Star cometh upon
the Meridian.

The Rule.

First seek the Right Ascension of that Star required in the foregoing Tables (of the Right Ascension of the Stars) and also the Right Ascension of the Sun: from the Right Ascension of the Star subtract the Right Ascension of the Sun; but when the Right Ascension of the Star is less than the Right Ascension of the Sun, then

The Use of the Tables, &c.

then add 24 hours thereto, and the Remainder will shew you the hour after noon when the Star cometh upon the Meridian, and if it do exceed 12 hours, then subtract 12 hours therefrom, and the remainder shall shew the hour and minute of the Stars coming upon the Meridian after Midnight.

Example I.

Upon the tenth of *April*, I would know when the Lions Heart cometh upon the Meridian. Therefore if you look in the Tables of Right Ascension for that Star, you will find it to be 9 hours 50 m. Then look in the Tables of Right Ascension of the Sun, and right against the tenth of *April* you will find the Right Ascension of the Sun to be 1 hour 54 m. which subtracted from the Right Ascension of the Star, there remains 7 hours 56 m. which is the true time that the Star cometh to the Meridian after noon.

Example II.

Upon the fifth of *November*, I desire to know when the Bulls Eye cometh upon the Meridian: The Right Ascension thereof by the Tables you will find to be 4 hours 16 minutes: the Right Ascension of the Sun that day is 15 hours 23 minutes. Therefore because the Right Ascension of the Star is less than the Right Ascension of the Sun, I add 24 hours to the Right Ascension of the Star, which maketh 28 hours 16 minutes: From which subtract the Right Ascension of the Sun, and the Remainder is 12 hours 53 minutes: From which I subtract the 12 hours, and the Remainder is 53 minutes after Midnight, then the said Star cometh upon the Meridian.

And here note, that the Table of Right Ascension of the Sun, is calculated for Noon every day; and that it doth increase by about 4 minutes each day; so that it may be proportioned, for every six hours to allow one minute for the time after noon.

A Table of the Latitude and Longitude of the Principal Ports, Harbours, Head-lands and Islands in the World: beginning from the Meridian of *Pico Teneriffa*, newly corrected according to the best Observations.

Those Places which are in South Latitude are marked with the Letter S. all the rest are in North Latitude.

		Latitud.	Longit.
		D. M.	D. M.
Green-Land	H Ackluiss Head-land	79 50	26 11
	Fair Foreland	79 15	24 50
	Point Look-out	76 25	32 00
	Cape Blanco	78 15	38 00
	Hopeless Isles	77 00	42 30
	Hope Island	76 13	41 50
Nova Zembla	Cherry Island	74 34	34 10
	Ice Point	77 45	90 50
	Admiralties Island	75 50	73 50
	Langeness	74 55	68 50
	Cross Point	72 25	68 00
	Fretum Burrough	70 40	75 00
The Sea-Coasts of Lapland and Norway	Maurisius Isle	71 24	71 10
	Archangel	63 23	55 20
	Cape Candense	69 35	58 00
	Fox naze	64 12	37 00
	Cape Gallant	67 11	39 30
	Cape Race	65 49	40 00
	Island Kilduym	68 54	38 00
	Norb Cape	71 22	32 30
	Ross Isles	67 01	25 00
	Catjniss	61 54	18 40
	Naze of Norway	58 00	25 00

A Table of Latitude and Longitude

		D. M.	D. M.
The Sound	The Nyding	57 05	25 40
	Scarlet Island	56 02	26 38
	Falsterborn	56 53	26 25
	Abbo	61 08	34 30
	Dagares	59 44	34 31
	Gotland	58 20	31 05
	Purnt Holm	56 00	28 16
	Elfenore	56 40	25 57
Flanders	The Scaw	57 52	24 27
	Bouenbergh	56 20	23 56
	Holy-land	54 30	12 14
	The Texel	53 20	20 56
	The Brill	52 08	19 44
	Calice	51 13	17 52
The Sea-Coasts of Island	Langness	67 20	03 45
	Maze	68 25	351.10
	Snow-Hill	65 40	344.40
	Merchants Fore-land	63 36	358.40
	Whale Back	65 18	003.00
Isles ni. Scotl.	St. Kilda	58 02	05 56
	Sky Island	57 40	10 08
	Lewis Island	58 30	08 00
	Sborland	60 22	14 30
	Isles of Orkney	58 50	13 25
England, Scotland	Carnefs	58 37	13 24
	Buchanefs	58 00	14 32
	St. Abbs Head	56 25	14 12
	Tinnmouth	55 08	15 00
	Flamborough Head	54 08	16 26
	The Sporne	53 45	16 58
	Wintertonefs	52 52	18 00

A Table of Latitude and Longitude.

		D. M.	D. M.
England	Orfordness	54 20	18 01
	The North Foreland	51 32	17 40
	The South Foreland	51 22	17 42
	Dongeness	51 09	17 14
	Isle of Wight	50 24	14 47
	Portland	50 10	13 44
	The Start	50 27	13 09
	The Lizard	50 00	12 37
	Islands of Silly	50 07	09 47
	Londy Isle	51 32	11 57
The Sea-Coasts of Ireland	St. Davids Head	51 54	11 18
	Holy Head	54 44	21 44
	Isle of Man	54 25	11 41
	Fair Foreland	55 35	10 16
	Black Rock	53 52	06 00
	Slieve Head	53 16	06 00
	Blasques	52 15	05 20
	Cape Clear	51 15	06 20
	Old Head	51 40	07 32
	Hearn Point	52 05	10 04
Portugal, Spain, France	Sain Head	50 04	16 50
	Cape Hage	50 04	15 05
	Garnsey	49 43	14 20
	Fersey	49 30	14 46
	Ushant	48 40	11 16
	Cape Ortegal	44 08	09 16
	Cape Finisterre	43 10	06 58
	The Rock of Lisbon	38 52	06 43
	Cape St. Vincent	37 00	07 20
	The Straits of Gibraltar	36 00	10 40

A Table of Latitude and Longitude.

The main Continent in the Straits

Cape de Gata
Cape St. Martin
Cape Dago Frito
Cape Melle
Cape Sparreventura
Cape St. Maria
Cape St. Angelo
Cape Saradoni
Cape de Becur
Cape Rosato
Cape Bona
Tunis
Tangier

D. M.	D. M.
36 47	16 08
38 46	18 57
41 41	21 49
43 51	26 21
37 46	36 06
39 52	38 16
37 15	42 56
35 35	48 46
32 40	50 48
32 58	40 28
37 05	30 12
36 40	19 46
35 36	11 35

The Sea-Coasts of

Islands within the Straits

Alboran
Formentara
Ivica
Majorca
Minorca
Cape Pulo in Sardinia
Cape Corso in Corsica
Limpadosa
Malta
Cape Passaro in Sicilia
Messina
Corfu
Cephalonia
Zant
West end of Candia
East end of Candia
Rhodes
West end of Cyprus
East end of Cyprus

37 52	15 18
38 44	19 38
39 05	19 50
39 38	21 20
39 55	22 30
38 56	27 36
42 51	27 37
55 58	31 52
36 00	33 12
37 10	34 52
38 07	35 08
39 25	39 18
38 28	40 29
37 37	40 40
35 15	43 00
35 04	46 28
35 40	48 00
34 22	51 34
34 48	54 35

Table of Latitude and Longitude.

		D. M.	D. M.
Barbary and Ginny	Cape Spartel	35 38	11 31
	Cape Cantin	32 27	07 31
	Cape Boiador	26 55	02 24
	Cape Blanco	20 32	358 50
	Cape Verde	14 36	358 50
	Sirre Leone	08 00	03 32
	Cape de Palmas	04 10	10 00
	Cape tres Puntas	04 06	16 00
	The North Point of Fernando	03 25	27 25
	Island St. Thomas	00 10	27 30
The Sea-Coasts of Western Islands	Cape Lupus	01 00S	27 40
	Cape Negro	16 00S	30 50
	Cape Boa Esperanza	34 24S	38 10
	The West side of Corua	40 00	345 30
	The West side of Flores	39 40	345 30
	The Road before Fial	38 50	347 47
	The West end of Pico	38 40	348 18
	The West end of Tercera	30 00	349 10
	The East end of St. Michael	38 00	351 40
	The East end of St. Maries	37 00	351 30
The Canary Islands	The North part of Ferro	27 40	358 25
	The East end of Palma	28 36	358 43
	Pico Teneriffa	28 20	00 00
	The East end of Madera	32 32	00 10
	The East end of Port Sanflo	33 00	01 00
	The N.E. of Canaria	28 10	01 00
	The N.E. of Fortventura	28 20	02 50
	The East part of Lancerotta	28 30	03 10

A Table of Latitude and Longitude.

		D. M.	D. M.
Cape de Verde Islands	The West side of St. Antonio	17 40	350 00
	The East point of St. Vincent	17 40	350 08
	The East side of St. Fago	15 00	352 30
	The East side of Isle de Mayo	15 00	353 04
	The East side of Bona Vista	16 00	353 04
	St. Matthews	01 40S	11 32
	Ascension	08 00S	04 30
	St. Helena	16 00S	13 50
	St. Helena Nova	16 03S	24 48
The Sea-Coasts of Main Continent in East-India	Cape Anguilhas	35 00S	39 30
	Cape Corintes	23 30S	56 00
	Cape de Guada	15 17S	59 56
	Cape de Guardafin	11 40	74 15
	Cape de Rasalgate	22 07	84 10
	Surrat	21 04	96 20
	Goa	15 40	97 00
	Cape Comerin	07 52	99 12
	S. W. point of Ceylon	06 00	101 56
	River Bengale	22 09	110 20
	Syam	14 52	122 45
	Fischers point	20 18	131 00
Islands in East India.	Point of Cavallos	25 16	140 58
	Corea	36 05	146 00
	Juhn de Libon	25 24S	75 52
	South end of St. Laurence	25 37S	68 00
	North end of St. Laurence	11 03S	73 00
	Mayotta	12 40S	66 30
	St. Hermanos	03 02S	84 00
	Diego Gratiola	08 03S	92 20
	The N. W. point of Sumatra	05 30	116 00
	The S. E. end of Sumatra	05 52S	125 40

A Table of Latitude and Longitude.

		D.	M.	D.
Islands in the East-Indies	Bantam	06	15S	126 30
	Batavia	06	10S	127 00
	Flores	58	50S	140 40
	Amboyna	03	52S	147 20
	South end of Celebes	05	45S	139 30
	North point of Celebes	02	16	144 00
	South point of Borneo	04	16S	135 00
	North point of Borneo	07	40	134 30
	South end of Lucon	12	42	143 40
	North end of Lucon	18	42	141 50
	South end of Formosa	21	20	142 00
	North end of Formosa	28	10	143 10
Sea-Coasts and Isles of America, South Sea	West end of Japan	34	00	150 00
	North point of Japan	40	05	163 20
	Straits of Anian	57	10	151 50
	Cape Blanco	42	00	245 10
	Sir Francis Drakes Bay	38	16	246 30
	Cape St. Lucas	23	10	266 10
	Gulf of Salina	10	00	238 20
	Cape de Passao	00	00X	291 30
	Truxilla	08	05S	295 00
	Island Ferando	33	47S	292 20
	Port St. Cyprian	43	16S	296 38
	West entrance of Magellano	53	00S	296 40
	Cape Horn	57	54S	363 00
	Honder Islands	14	00S	237 30
	Prince Williams Islands	18	14S	204 50
	States Land	38	00S	192 00
	Green Islands	04	00S	172 00
	Islands de Ladrones	10	00	170 00
	Barbadoes Isles	07	00	195 05
	Hermanes Isle	15	10	181 05

A Table of Latitude and Longitude.

	D. M.	D. M.
The Main of America		
Lemaire Straits	55 00S	310 16
East entrance of Magellane	52 20S	305 00
Cape Blanco	47 30S	309 49
Cape St. Antonio	36 38S	325 00
Cape St. Maria	35 00S	325 40
Cape Frio	22 52S	338 38
Baia de Todas Sanctas	13 00S	341 50
Cape St. Augustine	08 40S	345 40
River Cassipore	04 00	328 05
Surinam	05 05	323 40
Cape Rexo	22 40	275 16
La Florida	25 51	271 16
Cape Fair	34 02	298 25
Cape Henry	37 00	300 40
Cape Cod	42 20	308 40
Cape Race	46 36	328 30
Cape Bona Vista	49 19	328 36
The Sea-Coasts of		
Islands in the West-Indies		
Bermudas	32 18	310 50
Behama	27 57	295 20
Anguilla	18 48	313 35
St. Christophers	17 30	313 30
Antego	16 32	315 10
Martiners	14 30	316 36
Barbadoes	13 12	319 40
Mevis	17 00	314 00
Monferrat	16 20	314 20
East end of Hispaniola	18 47	308 10
West end of Hispaniola	18 25	300 10
Port Royal in Famaica	18 15	297 10
East end of Cuba	20 27	301 20
West end of Cuba	22 00	288 26
Great Caiman	19 21	293 30

A Table of Latitude and Longitude.

The Sea-Coasts of The Northern Parts of America		D.	M.	D.	M.
	Cape Cunas	53	40	226	51
	Resolution Isles	61	00	309	00
	Queen Anns Foreland	63	52	293	40
	Cape Charles	62	55	291	42
	Prince Ruperts River	51	00	289	12
	Cape Henrietta	56	16	279	10
	Pers Nelson	58	32	267	50
	Cape Southampton	62	30	279	25
	Sea-Horse Point	64	46	282	10
	Sir Dudley Digs Cape	75	10	298	00
	Cape Walsingham	65	42	311	20
	Cape Comfort	62	21	321	10
	Cape Desolation	61	20	325	05
	Cape Farewel	59	45	329	02

The Use of the Table of Latitude and Longitude of Places.

In this Table there are two Columns, the first shewing the Latitude, the second the Longitude of places. The uses are,

I. To find the Latitude and Longitude of any Place.

Example.

Of the *Start* on the Coast of England. Against the *Start* in the first Column the Latitude is 50 d. 27 m. which is North and in the second Column the Longitude is 13 d. 09 m.

Of Cape *Bona Esperanza* on the Coast of *Barbary*.

The Latitude 34 d. 24 m. South.

The Longitude 38 d. 10 m.

II. To

The Use of the Table, &c.

II. To find the Difference of Longitude between any two Places.

Take the Longitude of the two Places out of the Table, and subtract the lesser Longitude out of the greater, and if the Remainder be less than 180 d. that is the Difference of Longitude; but if the Remainder be more than 180 d. subtract it from 360 d. the last Remainder is the Difference of Longitude.

(1.) Example.

To find the Difference of Longitude between the *Lizard* and *Cape Bona Esperanza*.

The Longitude of the <i>Lizard</i> is	12 d. 37 m.
The Longitude of <i>Cape Bona Esperanza</i>	38 10
The Difference of Longitude	<hr/> 25 33

(2.) Example.

To find the Difference of Longitude between the *Lizard* and the *Barbadoes*.

The Longitude of <i>Barbadoes</i>	319 d. 40 m.
The Longitude of the <i>Lizard</i>	12 37
The first Remainder	<hr/> 307 03
Subtracted from	360 00

The last Remainder being Diff. of Long. 52 57

III. To know when the Difference of Longitude between any two Places is Easterly or Westerly.

If the Remainder first found be less than 180 d. and you are to sail to that place which hath the greater Longitude of the two, your Difference of Longitude is Easterly; but if you are to sail to that which hath the less, your Difference of Longitude is Westerly.

2. If the Remainder first found be greater than 180 d. then if you are bound to that place which hath the greater Longitude of the two, your Difference of Longitude is Westerly; if to that which hath the less, your Difference of Longitude is Easterly.

F

The

The first Year after Leap-Year.

Suns Declination 1673, 1677, 1681, 1685.

Days	Januar.		Februa.		March		April		May		June	
	South		South		South		North		North		North	
01	21	42	13	44	03	23	08	37	18	06	23	11
02	21	32	13	34	02	59	08	59	18	21	23	15
03	21	22	13	04	02	35	09	21	18	35	23	18
04	21	11	12	44	02	12	09	42	18	50	23	21
05	21	00	12	23	01	48	10	03	19	04	23	23
06	20	48	12	02	01	24	10	25	19	18	23	26
07	20	36	11	41	01	01	10	46	19	31	23	27
08	20	24	11	19	00	37	11	07	19	44	23	29
09	20	11	10	58	00	13	11	27	19	57	23	29
10	19	57	10	36	Nor.	11	11	48	20	10	23	30
11	19	44	10	15	00	34	12	08	20	22	23	30
12	19	30	09	53	00	58	12	28	20	33	23	30
13	19	16	09	31	01	21	12	48	20	45	23	29
14	19	01	09	08	01	45	13	08	20	56	23	28
15	18	46	08	46	02	09	13	27	21	07	23	26
16	18	31	08	24	02	32	13	46	21	17	23	24
17	18	15	08	01	02	55	14	06	21	27	23	22
18	17	59	07	38	03	19	14	24	21	37	23	19
19	17	43	07	15	03	42	14	43	21	46	23	16
20	17	26	06	52	04	05	15	01	21	55	23	12
21	17	09	06	29	04	29	15	19	22	03	23	08
22	16	52	06	06	04	52	15	37	22	11	23	03
23	16	34	05	43	05	15	15	55	22	19	22	58
24	16	16	05	20	05	38	16	12	22	26	22	53
25	15	58	04	57	06	00	16	29	22	33	22	48
26	15	40	04	33	06	23	16	46	22	40	22	41
27	15	21	04	10	06	46	17	02	22	46	22	34
28	15	02	03	46	07	08	17	19	22	52	22	28
29	14	43			07	31	17	35	22	57	22	21
30	14	24			07	53	17	50	23	02	22	13
31	14	04			08	15			23	07		

Suns Declination 1673, 1677, 1681, 1684

Days	July		August		Septemb.		October		Novemb.		Decemb.	
	North		North		North		South		South		South	
01	22	05	15	09	04	20	07	18	17	42	23	08
02	21	57	14	50	03	57	07	41	17	58	23	12
03	21	48	14	32	03	34	08	03	18	14	23	16
04	21	39	14	13	03	11	08	26	18	29	23	29
05	21	30	13	55	02	48	08	48	18	44	23	22
06	21	20	13	36	02	24	09	10	18	59	23	25
07	21	10	13	16	02	01	09	32	19	14	23	27
08	20	59	12	57	01	38	09	54	19	28	23	28
09	20	48	12	37	01	14	10	16	19	42	23	29
10	20	37	12	17	00	51	10	38	19	56	23	30
11	20	25	11	57	00	27	10	59	20	09	23	30
12	20	13	11	37	00	04	11	21	20	22	23	30
13	20	01	11	17	South.	20	11	42	20	34	23	29
14	19	48	10	56	00	43	12	03	20	46	23	28
15	19	35	10	35	01	07	12	23	20	58	23	26
16	19	22	10	14	01	30	12	44	21	09	23	23
17	19	08	09	53	01	54	13	04	21	20	23	21
18	18	54	09	32	02	17	13	24	21	31	23	17
19	18	40	09	10	02	41	13	44	21	41	23	14
20	18	25	08	49	03	04	14	04	21	50	23	10
21	18	11	08	27	03	27	14	24	22	00	23	05
22	17	56	08	05	03	51	14	43	22	08	23	00
23	17	40	07	43	04	14	15	02	22	17	22	54
24	17	24	07	21	04	37	15	21	22	25	22	48
25	17	08	06	59	05	01	15	39	22	32	22	42
26	16	52	06	36	05	24	15	58	22	39	22	35
27	16	35	06	14	05	47	16	16	22	46	22	28
28	16	19	05	51	06	10	16	33	22	52	22	20
29	16	01	05	29	06	33	16	51	22	58	22	12
30	15	44	05	06	06	56	17	08	23	03	22	03
31	15	27	04	43			17	25		21	21	54

The Second Year after Leap-Year.

Suns Declination 1674, 1678, 1682, 1686.

Days	January		February.		March		April		May		June	
	South		South		South		North		North		North	
01	21	45	13	49	03	28	08	32	18	02	23	10
02	21	35	13	29	03	05	08	54	18	17	23	14
03	21	24	13	09	02	41	09	15	18	32	23	17
04	21	14	12	49	02	17	09	37	18	46	23	20
05	21	02	12	28	01	54	09	58	19	00	23	23
06	20	51	12	07	01	30	10	20	19	14	23	25
07	20	39	11	46	01	06	10	41	19	28	23	27
08	20	27	11	25	00	43	11	02	19	41	23	28
09	20	14	11	03	00	19	11	22	19	54	23	29
10	20	01	10	42	Nor. 05	11	43	20	07	23	23	30
11	19	47	10	20	00	28	12	04	20	19	23	30
12	19	33	09	58	00	52	12	23	20	31	23	30
13	19	19	09	36	01	16	12	43	20	42	23	29
14	19	05	09	14	01	39	13	03	20	53	23	28
15	18	50	08	52	02	03	13	23	21	04	23	26
16	18	34	08	29	02	26	13	42	21	15	23	25
17	18	19	08	06	02	50	14	01	21	25	23	22
18	18	03	07	44	03	13	14	20	21	34	23	19
19	17	47	07	21	03	37	14	38	21	44	23	16
20	17	30	06	58	04	00	14	57	21	53	23	13
21	17	13	06	35	04	23	15	15	21	01	23	09
22	16	56	06	12	04	46	15	33	22	09	23	04
23	16	39	05	49	05	09	15	51	22	17	23	00
24	16	21	05	26	05	32	16	08	22	25	22	54
25	16	03	05	02	05	55	16	25	22	32	22	49
26	15	44	04	39	06	18	16	42	22	38	22	43
27	15	26	04	15	06	40	16	58	22	45	22	37
28	15	07	03	52	07	03	17	15	22	51	22	30
29	14	48			07	25	17	31	22	56	22	23
31	14	29			07	48	17	46	23	01	22	15
30	14	09			08	10			23	06		

Suns Declination 1674, 1678, 1682, 1686.

Days	July		August		Septemb.		October		Novemb.		Decemb.	
	North		North		North		South		South		South	
01	22	07	15	13	04	26	07	13	17	37	23	07
02	21	59	14	55	04	03	07	35	17	54	23	11
03	21	50	14	37	03	40	07	58	18	10	23	15
04	21	41	14	18	03	16	08	21	18	25	23	19
05	21	32	13	59	02	53	08	43	18	41	23	22
06	21	22	13	40	02	30	09	05	18	56	23	24
07	21	12	13	21	02	07	09	27	19	11	23	26
08	21	02	13	02	01	43	09	49	19	25	23	28
09	20	51	12	42	01	20	10	11	19	39	23	29
10	20	40	12	22	00	57	10	33	19	53	23	30
11	20	28	12	02	00	33	10	54	20	06	23	30
12	20	16	11	42	00	10	11	15	20	19	23	30
13	20	04	11	22	Sou.	14	11	37	20	31	23	29
14	19	51	11	01	00	37	11	58	20	43	23	28
15	19	38	10	40	01	01	12	18	20	55	23	26
16	19	25	10	19	01	24	12	39	21	07	23	24
17	19	12	09	58	01	48	12	59	21	18	23	21
18	18	58	09	37	02	11	13	20	21	28	23	18
19	18	44	09	16	02	35	13	40	21	38	23	15
20	18	29	08	54	02	58	13	59	21	48	23	11
21	18	14	08	32	03	22	14	19	21	57	23	06
22	17	59	08	10	03	45	14	38	22	06	23	01
23	17	44	07	48	04	08	14	57	22	15	22	56
24	17	28	07	26	04	32	15	16	22	23	22	50
25	17	12	07	04	04	55	15	35	22	30	22	44
26	16	55	06	42	05	18	15	53	22	38	22	37
27	16	39	06	19	05	41	16	11	22	44	22	30
28	16	23	05	57	06	04	16	29	22	51	22	22
29	16	06	05	34	06	27	16	47	22	56	22	14
30	15	48	05	11	06	50	17	04	23	02	22	05
31	15	31	04	49			17	21			21	56

The third Year after Leap-Year.

Suns Declination 1675, 1679, 1683, 1687.

Days	January		February		March		April		May		June	
	South		South		South		North		North		North	
01	21	47	13	54	03	34	08	26	17	58	23	09
02	21	37	13	34	03	10	08	48	18	13	23	13
03	21	27	13	14	02	47	09	10	18	28	23	16
04	21	16	12	54	02	23	09	32	18	43	23	20
05	21	05	12	33	01	59	09	53	18	57	23	23
06	20	54	12	11	01	36	10	14	19	11	23	25
07	20	42	11	51	01	12	10	36	19	25	23	27
08	20	30	11	30	00	48	10	56	19	38	23	28
09	20	17	11	09	00	25	11	17	19	51	23	29
10	20	04	10	47	00	01	11	38	20	04	23	30
11	19	51	10	25	Nor.	23	11	58	20	16	23	30
12	19	37	10	03	00	46	12	18	20	28	23	30
13	19	23	09	41	01	10	12	38	20	39	23	29
14	19	08	09	19	01	34	12	58	20	51	23	28
15	18	53	08	57	01	57	13	18	21	02	23	27
16	18	38	08	35	02	21	13	37	21	12	23	25
17	18	23	08	12	02	44	13	56	21	22	23	23
18	18	07	07	49	03	08	14	15	21	32	23	20
19	17	51	07	27	03	31	14	34	21	41	23	17
20	17	34	07	04	03	54	14	52	21	50	23	14
21	17	17	06	41	04	17	15	11	21	59	23	10
22	17	00	06	18	04	41	15	29	22	07	23	06
23	16	43	05	54	05	04	15	46	22	15	23	01
24	16	25	05	31	05	27	16	04	22	23	22	56
25	16	07	05	08	05	49	16	21	22	30	22	50
26	15	49	04	44	06	12	16	38	22	37	22	44
27	15	30	04	21	06	35	16	54	22	43	22	38
28	15	12	03	58	06	57	17	11	22	49	22	32
29	14	53			07	20	17	27	22	55	22	25
30	14	33			07	42	17	43	23	00	22	17
31	14	14			08	04			23	05		

Suns Declination 1675, 1679, 1683, 1687.

Days	July		August		Septemb.		October		Novemb.		Decemb.	
	North		North		North		South		South		South	
01	22	09	15	17	04	31	07	07	17	33	23	05
02	22	01	14	59	04	08	07	30	17	50	23	10
03	21	53	14	41	03	45	07	53	18	06	23	14
04	21	44	14	23	03	22	08	15	18	22	23	18
05	21	34	14	04	02	59	08	37	18	37	23	21
06	21	25	13	45	02	36	09	00	18	52	23	24
07	21	15	13	26	02	12	09	22	19	07	23	26
08	21	04	13	06	01	49	09	44	19	21	23	28
09	20	53	12	47	01	26	10	06	19	36	23	29
10	20	42	12	27	01	02	10	27	19	49	23	30
11	20	31	12	07	00	39	10	49	20	03	23	30
12	20	19	11	47	00	15	11	10	20	16	23	30
13	20	07	11	27	00	08	11	31	20	28	23	29
14	19	54	11	06	00	32	11	52	20	40	23	28
15	19	42	10	45	00	55	12	13	20	52	23	27
16	19	28	10	24	01	19	12	34	21	04	23	25
17	19	15	10	03	01	42	12	54	21	15	23	23
18	19	01	09	42	02	06	13	15	21	26	23	19
19	18	47	09	21	02	29	13	35	21	36	23	16
20	18	33	08	59	02	53	13	55	21	46	23	12
21	18	18	08	38	03	16	14	14	21	55	23	07
22	18	03	08	16	03	39	14	33	22	04	23	02
23	17	48	07	54	04	03	14	53	22	13	22	57
24	17	32	07	32	04	26	15	13	22	21	22	51
25	17	16	07	10	04	49	15	30	22	29	22	45
26	17	00	06	47	05	13	15	49	22	36	22	39
27	16	43	06	25	05	36	16	07	22	43	22	31
28	16	27	06	02	05	59	16	24	22	49	22	24
29	16	10	05	40	06	22	16	42	22	55	22	16
30	15	53	05	17	06	45	17	00	23	00	22	07
31	15	35	04	54			17	17			21	59

The Leap-Years.

Suns Declination 1676, 1680, 1684, 1688

Days	Januar.		Februa.		March		April		May		June	
	South		South		South		North		North		North	
01	21	49	13	59	03	16	08	43	18	10	23	13
02	21	39	13	39	02	52	09	05	18	25	23	16
03	21	29	13	19	02	29	09	26	18	39	23	19
04	21	19	12	59	02	05	09	48	18	54	23	22
05	21	08	12	38	01	42	10	09	19	08	23	24
06	20	56	12	17	01	18	10	30	19	21	23	26
07	20	45	11	56	00	54	10	51	19	35	23	28
08	20	33	11	35	00	30	11	12	19	48	23	29
09	20	20	11	14	00	07	11	33	20	01	23	30
10	20	07	10	52	Nor.	17	11	53	20	13	23	30
11	19	54	10	31	00	41	12	14	20	25	23	30
12	19	40	10	09	01	04	12	34	20	37	23	29
13	19	26	09	47	01	28	12	53	20	48	23	28
14	19	12	09	25	01	51	13	13	20	59	23	27
15	18	57	09	02	02	15	13	33	21	10	23	25
16	18	42	08	40	02	38	13	52	21	20	23	23
17	18	26	08	17	03	02	14	11	21	30	23	21
18	18	11	07	55	03	25	14	29	21	39	23	18
19	17	55	07	32	03	48	14	48	21	48	23	15
20	17	38	07	09	04	12	15	06	21	57	23	11
21	17	21	06	46	04	35	15	24	22	06	23	07
22	17	04	06	23	04	58	15	42	22	13	23	03
23	16	47	06	00	05	21	15	59	22	21	22	57
24	16	30	05	37	05	44	16	17	22	28	22	52
25	16	12	05	14	06	07	16	34	22	35	22	46
26	15	53	04	50	06	29	16	50	22	42	22	40
27	15	35	04	27	06	52	17	07	22	48	22	33
28	15	16	04	03	07	14	17	23	22	53	22	26
29	14	57	03	40	07	37	17	39	22	58	22	19
30	14	38			07	59	17	54	23	03	22	11
31	14	19			08	21			23	08		

Suns Declination 1676, 1680, 1684, 1688.

Days	July		August		Septemb.		October		Novemb.		Decemb.	
	North		North		North		South		South		South	
01	22	03	15	04	04	14	07	25	17	46	23	09
02	21	55	14	45	03	51	07	47	18	02	23	13
03	21	46	14	27	03	28	08	10	18	18	23	17
04	21	37	14	08	03	04	08	32	18	33	23	20
05	21	27	13	49	02	41	08	54	18	49	23	23
06	21	17	13	30	02	18	09	16	19	03	23	25
07	21	07	13	11	01	55	09	38	19	18	23	27
08	20	56	12	52	01	31	10	00	19	32	23	29
09	20	45	12	32	01	08	10	22	19	46	23	29
10	20	34	12	12	00	44	10	44	19	59	23	30
11	20	22	11	52	00	21	11	05	20	13	23	30
12	20	10	11	31	Son.		11	26	20	25	23	29
13	19	57	11	11	00	26	11	47	20	38	23	28
14	19	45	10	50	00	50	12	08	20	50	23	27
15	19	32	10	29	01	13	12	29	21	01	23	25
16	19	18	10	08	01	37	12	49	21	12	23	23
17	19	04	09	47	02	00	13	10	21	23	23	20
18	18	50	09	26	02	24	13	30	21	33	23	16
19	18	36	09	04	02	47	13	50	21	43	23	13
20	18	21	08	43	03	10	14	09	21	53	23	08
21	18	07	08	21	03	34	14	29	22	02	23	04
22	17	51	07	59	03	57	14	48	22	11	22	58
23	17	36	07	37	04	20	15	07	22	19	22	53
24	17	20	07	15	04	44	15	26	22	27	22	47
25	17	04	06	53	05	07	15	44	22	34	22	40
26	16	47	06	30	05	30	16	02	22	41	22	33
27	16	31	06	08	05	53	16	20	22	48	22	26
28	16	14	05	45	06	16	16	38	22	54	22	18
29	15	57	05	23	06	39	16	55	22	59	22	09
30	15	39	05	00	07	02	17	12	23	04	22	01
31	15	22	04	37			17	29			21	52

The Use of the Table, &c.

The Use of the Table of the Suns Declination.

These Tables shew the Suns Declination at noon, in the years 1673, 1674, &c. to the end of 1688; and these years are distinguished in the Title of the Table into the first, the second, and the third years after the Leap-years, and into the Leap-years.

In every Page of this Table there are seven Columns; in the first are the Days of the Month, and in the other six the Months of the Year. The Declination is distinguished by the title of North and South at the head of the Table, and likewise against the 10. or 11. of March is [Nor.] for North, and against the 10. or 11. of September is [Sou.] for South Declination; because about the 10. or 11. of March the Declination is changed from South to North, and about the 10. or 11. of September from North to South.

Example.

To find the Suns Declination the 10. of May at noon, 1675.

Turn over the Table till you find the year 1675, which you will find to be the third after Leap-year, and against the 10. day and under the Month of May you will find the Declination to be 20 d. 4 m, North.

To find the Suns Declination the 21. of October, at noon, 1680.

Turn over the Table till you find the year 1680, which you will find to be Leap-year, and against the 21. day, and under the Month October, you will find the Suns Declination to be 14 d. 48 m. South.

Note, that in the Leap-year February hath 29 days.

The Bearing, Distance and longest Day of most of the principal Cities and Places in the World, from the famous City of L O N D O N.

Names of the Places.	Point of Bearing.	Dist. miles	Length of Day
Alexandria in Egypt	S.E. by E.	2169	14 05
Amsterdam in Holland	E. by N.	266	16 40
Antwerp in Brabant	East fere	248	16 28
Babylon	E.S.E.	2724	14 25
Barwick	North fere	267	17 24
Calice in France	E. by S.	86	16 25
Calicut in East-India	S.E. by E.	5214	12 20
Constantinople	E.S.E.	1547	15 15
Dantzick	E.N.E.	961	17 05
Dublin in Ireland	NW. by W.	296	17 15
Edenburgh in Scotland	North	328	17 40
Florence	South-East	802	15 10
Frankford	East fere	448	16 15
Hamburg	E.N.E.	538	18 00
Jerusalem	S.E. by E.	2352	14 08
Island	N.N.W.	930	21 44
Lisbon in Portugal	S.S.W.	985	14 45
Mentz in Germany	East	410	16 25
Mexico	W. by S.	6844	13 20
Middleburgh in Zeland	East	205	16 30
Morocco in Barbary	S.S.W.	1449	14 00
Naples	S.E. by E.	1051	14 50
Paris in France	S.S.E.	215	15 57
Prague in Bohemia	East fere	700	16 15
Quinai in China	E. by S.	7272	13 35
Rome	S.E. by E.	887	15 04
Sevil	S. by W.	950	14 40
Spitrs	E. by S.	430	16 02
Toledo in Spain	S. by W.	934	14 36
Troy	E.S.E.	1605	15 00
Venice	E.S.E.	744	15 28
York	North fere	150	17 00
L O N D O N			16 36

A Table of Diff. of Latitude and Departure																			
Distance	$\frac{1}{4}$ Point.				$\frac{1}{2}$ Point.				$\frac{3}{4}$ Point.				1 Point.						
	Lat.		Dep.		Lat.		Dep.		Lat.		Dep.		Lat.		Dep.				
1	1	00	0		1	00	1		1	00	1		1	00	2				
2	2	00	1		2	00	2		2	00	3		2	00	4				
3	3	00	1		3	00	3		3	00	4		2	90	6				
4	4	00	2		4	00	4		4	00	6		3	90	8				
5	5	00	2		5	00	5		5	00	7		4	91	0				
6	6	00	3		6	00	6		5	90	8		5	91	2				
7	7	00	3		7	00	7		6	91	0		6	91	4				
8	8	00	4		8	00	8		7	91	2		7	81	6				
9	9	00	4		9	00	9		8	91	3		8	81	8				
10	10	00	5		10	01	0		9	91	5		9	82	0				
11	11	00	5		10	91	1		10	91	6		10	82	1				
12	12	00	6		11	91	2		11	91	8		11	82	3				
13	13	00	6		12	91	3		12	91	9		12	82	5				
14	14	00	7		13	91	4		13	92	0		13	72	7				
15	15	00	7		14	91	5		14	92	2		14	72	9				
16	16	00	8		15	91	6		15	92	3		15	73	1				
17	17	00	8		16	91	7		16	92	5		16	73	3				
18	18	00	9		17	91	8		17	82	6		17	73	5				
19	19	00	9		18	91	9		18	82	8		18	63	7				
20	20	01	0		19	92	0		19	82	9		19	63	9				
21	21	01	0		20	92	1		20	83	1		20	64	1				
22	22	01	1		21	92	2		21	83	2		21	64	3				
23	23	01	1		22	92	3		22	83	4		22	64	5				
24	24	01	2		23	92	4		23	83	5		23	64	7				
25	25	01	2		24	92	5		24	83	7		24	54	9				
26	26	01	3		25	92	6		25	73	8		25	55	1				
27	27	01	3		26	92	7		26	74	0		26	55	3				
28	28	01	4		27	92	8		27	74	1		27	55	5				
29	29	01	4		28	92	9		28	74	3		28	45	7				
30	30	01	5		29	92	9		29	74	4		29	45	8				
Dep.		Lat.		Dep.		Lat.		Dep.		Lat.		Dep.		Lat.		Lat.			
$\frac{1}{4}$ Point.				$\frac{1}{2}$ Point.				$\frac{3}{4}$ Point.				1 Point.							

A Table of Diff of Latitude and Departure.

Distance	$\frac{1}{4}$ Point.				$\frac{1}{2}$ Point.				$\frac{3}{4}$ Point.				1 Point.				Distance		
	Lat.		Dep.		Lat.		Dep.		Lat.		Dep.		Lat.		Dep.				
31	31	0	1	5	30	8	3	0	30	7	4	6	30	4	6	0	31		
32	32	0	1	6	31	8	3	1	31	7	4	7	31	4	6	2	32		
33	33	0	1	6	32	8	3	2	32	7	4	9	32	4	6	4	33		
34	34	0	1	7	33	8	3	3	33	7	5	0	33	3	6	6	34		
35	35	0	1	7	34	8	3	4	34	6	5	2	34	3	6	8	35		
36	36	0	1	8	35	8	3	5	35	6	5	3	35	3	7	0	36		
37	37	0	1	8	36	8	3	6	36	6	5	5	36	3	7	2	37		
38	38	0	1	9	37	8	3	7	37	6	5	6	37	3	7	4	38		
39	39	0	1	9	38	8	3	8	38	6	5	8	38	3	7	6	39		
40	40	0	2	0	39	8	3	9	39	6	5	9	39	2	7	8	40		
41	40	9	2	0	40	8	4	0	40	6	6	1	40	1	8	0	41		
42	41	9	2	1	41	8	4	1	41	6	6	2	41	2	8	2	42		
43	42	9	2	1	42	8	4	2	42	5	6	4	42	2	8	4	43		
44	43	9	2	2	43	8	4	3	43	5	6	5	43	2	8	6	44		
45	44	9	2	2	44	8	4	4	44	5	6	7	44	1	8	8	45		
46	45	9	2	3	45	8	4	5	45	5	6	8	45	1	9	0	46		
47	46	9	2	3	46	8	4	6	46	5	7	0	46	1	9	2	47		
48	47	9	2	4	47	8	4	7	47	5	7	1	47	1	9	4	48		
49	48	9	2	4	48	8	4	8	48	5	7	2	48	1	9	6	49		
50	49	9	2	5	49	8	4	9	49	5	7	3	49	0	9	8	50		
51	50	9	2	5	50	7	5	0	50	4	7	5	50	0	9	9	51		
52	51	9	2	5	51	7	5	1	51	4	7	6	51	0	10	1	52		
53	52	9	2	6	52	7	5	2	52	4	7	8	52	0	10	3	53		
54	53	9	2	6	53	7	5	3	53	4	7	9	53	0	10	5	54		
55	54	9	2	7	54	7	5	4	54	4	8	1	53	9	10	7	55		
56	55	9	2	7	55	7	5	5	55	4	8	2	54	9	10	9	56		
57	56	9	2	8	56	7	5	6	56	4	8	4	55	9	11	1	57		
58	57	9	2	8	57	7	5	7	57	4	8	5	56	9	11	3	58		
59	58	9	2	9	58	7	5	8	58	3	8	6	57	9	11	5	59		
60	59	9	2	9	59	7	5	9	59	3	8	8	58	8	11	7	60		
Dep.		Lat.		Dep.		Lat.		Dep.		Lat.		Dep.		Lat.					
$7 \frac{1}{4}$ Point.				$7 \frac{1}{2}$ Point.				$7 \frac{3}{4}$ Point.				7 Points.							

A Table of Diff. of Latitude and Departure																
Distance	1 $\frac{1}{4}$ Point.				1 $\frac{1}{2}$ Point.				1 $\frac{3}{4}$ Point.				2 Points.			
	Lat.		Dep.		Lat.		Dep.		Lat.		Dep.		Lat.		Dep.	
1	1	0	0	2	1	0	0	3	0	9	0	3	0	9	0	4
2	1	9	0	5	1	9	0	6	1	9	0	7	1	8	0	8
3	2	9	0	7	2	9	0	9	2	8	1	0	2	8	1	1
4	3	9	1	0	3	8	1	2	3	8	1	3	3	7	1	5
5	4	8	1	2	4	8	1	5	4	7	1	7	4	6	1	9
6	5	8	1	4	5	7	1	7	5	6	2	0	5	5	2	3
7	6	8	1	7	6	7	2	0	6	6	2	4	6	5	2	7
8	7	8	1	9	7	6	2	3	7	6	2	7	7	4	3	1
9	8	7	2	2	8	6	2	6	8	5	3	0	8	3	3	4
10	9	7	2	4	9	6	2	9	9	4	3	4	9	2	3	8
11	10	7	2	7	10	5	3	2	10	3	3	7	10	2	4	2
12	11	6	2	9	11	5	3	5	11	3	4	0	11	1	4	6
13	12	6	3	1	12	4	3	8	12	2	4	4	12	0	5	0
14	13	6	3	4	13	4	4	1	13	2	4	8	13	0	5	4
15	14	6	3	6	14	3	4	4	14	1	5	1	13	9	5	8
16	15	5	3	9	15	3	4	7	15	0	5	4	14	8	6	1
17	16	5	4	1	16	2	5	0	16	0	5	7	15	7	6	5
18	17	5	4	4	17	2	5	2	16	9	6	0	16	7	6	9
19	18	4	4	6	18	2	5	5	17	9	6	4	17	6	7	2
20	19	4	4	8	19	1	5	8	18	8	6	7	18	5	7	6
21	20	4	5	0	20	1	6	1	19	7	7	0	19	5	8	0
22	21	3	5	3	21	0	6	4	20	7	7	4	20	4	8	4
23	22	3	5	6	22	0	6	7	21	6	7	7	21	3	8	8
24	23	3	5	8	23	0	7	0	22	6	8	0	22	2	9	1
25	24	2	6	0	23	9	7	3	23	5	8	4	23	1	9	5
26	25	2	6	3	24	9	7	6	24	4	8	7	24	0	9	9
27	26	2	6	5	25	8	7	9	25	4	9	0	25	0	10	3
28	27	2	6	8	26	8	8	2	26	3	9	4	25	9	10	7
29	28	1	7	0	27	7	8	5	27	2	9	7	26	8	11	1
30	29	1	7	3	28	7	8	7	28	2	10	1	27	7	11	5
Dep. Lat.				Dep. Lat.				Dep. Lat.				Dep. Lat.				
6 $\frac{1}{4}$ Points.				6 $\frac{1}{2}$ Points.				6 $\frac{3}{4}$ Points.				6 Points.				

A Table of Diff of Latitude and Departure.

1 $\frac{1}{4}$ Point.				1 $\frac{1}{2}$ Point.				1 $\frac{3}{4}$ Point.				2 Points.				Distance.	
Lat.		Dep.		Lat.		Dep.		Lat.		Dep.		Lat.		Dep.			
31	30	17	5	29	6	9	0	29	1	10	4	28	6	11	9	31	
32	31	07	7	30	6	9	2	30	1	10	8	29	5	12	3	32	
33	32	08	0	31	6	9	5	31	0	11	1	30	5	12	7	33	
34	33	08	2	32	5	9	8	31	9	11	4	31	4	13	1	34	
35	34	08	5	33	5	10	1	32	9	11	8	32	3	13	5	35	
36	34	9	8	34	4	10	4	33	8	12	1	33	2	13	8	36	
37	35	9	0	35	4	10	7	34	8	12	4	34	1	14	2	37	
38	36	9	2	36	3	11	0	35	7	12	8	35	0	14	6	38	
39	37	8	4	37	3	11	3	36	7	13	1	36	0	15	0	39	
40	38	8	7	38	3	11	6	37	7	13	5	36	9	15	3	40	
41	39	8	9	39	2	11	9	38	6	13	8	37	8	15	7	41	
42	40	7	10	40	2	12	2	39	0	14	1	38	7	16	1	42	
43	41	7	10	41	1	12	5	40	5	14	5	39	6	16	5	43	
44	42	7	10	42	1	12	8	41	4	14	8	40	6	16	9	44	
45	43	7	10	43	0	13	0	42	4	15	1	41	5	17	2	45	
46	44	6	11	44	0	13	3	43	3	15	5	42	4	17	6	46	
47	45	6	11	44	9	13	6	44	3	15	8	43	4	18	0	47	
48	46	6	11	45	9	13	9	45	2	16	1	44	3	18	4	48	
49	47	5	11	46	9	14	2	46	2	16	5	45	2	18	8	49	
50	48	5	12	47	8	14	5	47	1	16	8	46	2	19	1	50	
51	49	5	12	48	8	14	8	48	0	17	1	47	1	19	5	51	
52	50	4	12	49	7	15	1	49	0	17	5	48	0	19	9	52	
53	51	4	12	50	7	15	4	49	9	17	9	49	0	20	2	53	
54	52	4	13	51	6	15	7	50	8	18	2	49	9	20	6	54	
55	53	4	13	52	6	16	0	51	8	18	5	50	8	21	0	55	
56	54	3	13	53	5	16	3	52	7	18	9	51	8	21	4	56	
57	55	3	13	54	5	16	6	53	7	19	2	52	7	21	8	57	
58	56	3	14	55	4	16	9	54	6	19	5	53	6	22	2	58	
59	57	2	14	56	4	17	1	55	6	19	9	54	5	22	6	59	
60	58	2	14	57	4	17	4	56	5	20	2	55	4	23	0	60	
Dep.		Lat.		Dep.		Lat.		Dep.		Lat.		Dep.		Lat.			
6 $\frac{1}{4}$ Point.				6 $\frac{1}{2}$ Point.				6 $\frac{3}{4}$ Point.				6 Points.					

A Table of Diff. of Latitude and Departure.

Line No.	2 $\frac{1}{4}$ Point.				2 $\frac{1}{2}$ Point.				2 $\frac{3}{4}$ Point.				3 Points.					
	Lat.		Dep.		Lat.		Dep.		Lat.		Dep.		Lat.		Dep.			
1	0	9	0	4	0	9	0	5	0	9	0	5	0	8	0	6		
2	1	8	0	9	1	8	0	9	1	7	1	0	1	7	1	1		
3	2	7	1	3	2	6	1	4	2	6	1	5	2	5	1	7		
4	3	6	1	7	3	5	1	9	3	4	2	1	3	3	2	2		
5	4	5	2	1	4	4	2	4	4	3	2	6	4	2	2	8		
6	5	4	2	6	5	3	2	8	5	1	3	1	5	0	3	3		
7	6	3	3	0	6	2	3	3	6	0	3	6	5	8	3	9		
8	7	2	3	4	7	0	3	8	6	9	4	1	6	7	4	4		
9	8	1	3	8	7	9	4	2	7	7	4	6	7	5	5	0		
10	9	0	4	3	8	8	4	7	8	6	5	1	8	3	5	6		
11	9	9	4	7	9	7	5	2	9	4	5	6	9	2	6	1		
12	10	8	5	1	10	6	5	6	10	3	6	2	10	0	6	7		
13	11	7	5	6	11	5	6	1	11	1	6	7	10	8	7	2		
14	12	6	6	0	12	4	6	5	12	0	7	2	11	7	7	8		
15	13	5	6	4	13	2	7	0	12	9	7	7	12	5	8	3		
16	14	5	6	9	14	1	7	5	13	7	8	2	13	3	8	9		
17	15	4	7	3	15	0	7	9	14	6	8	7	14	2	9	4		
18	16	3	7	7	15	9	8	4	15	4	9	2	15	0	10	0		
19	17	2	8	1	16	8	8	9	16	3	9	7	15	8	10	6		
20	18	1	8	6	17	6	9	4	17	1	10	3	16	6	11	1		
21	19	0	9	0	18	5	9	8	18	0	10	8	17	5	11	7		
22	19	9	9	4	19	4	10	3	18	9	11	3	18	3	12	2		
23	20	8	9	8	20	3	10	8	19	7	11	8	19	2	12	8		
24	21	7	10	3	21	2	11	2	20	6	12	3	20	0	13	3		
25	22	6	10	7	22	1	11	7	21	4	12	8	20	8	13	9		
26	23	5	11	1	23	0	12	2	22	3	13	3	21	7	14	4		
27	24	4	11	6	23	8	12	6	23	1	13	8	22	5	15	0		
28	25	3	12	0	24	7	13	1	24	0	14	3	23	3	15	6		
29	26	3	12	4	25	6	13	6	24	9	14	8	24	1	16	1		
30	27	1	12	8	26	5	14	1	25	7	15	4	24	9	16	7		
Dep.		Lat.			Dep.		Lat.			Dep.		Lat.			Dep.		Lat.	
5 $\frac{1}{4}$ Point.					5 $\frac{1}{2}$ Point.					5 $\frac{3}{4}$ Point.					5 Points.			

A
TRIANGULAR
CANON
LOGARITHMICAL:
OR, A
TABLE
OF
Artificial Sines and Tangents,
To every
DEGREE and MINUTE
OF THE
QUADRANT.

The Common Radius being 10.0000000.

LONDON: Printed for W. Fisher, near the
Postern on Tower-Hill. 1674.

0 Degree.				
Minut.	Sine	Sine Complement	Tang.	Tangent Complement
0	0.0000000	1.0000000	0.0000000	Infinite
1	6.4617361	9.9999999	6.4617361	13.5362739
2	6.7247561	9.9999999	6.7247561	13.2352438
3	6.9408473	9.9999998	6.9408473	13.0591525
4	7.0657860	9.9999997	7.0657860	12.9142127
5	7.1624960	9.9999995	7.1624960	12.8373036
6	7.2418771	9.9999993	7.2418771	12.7582222
7	7.3088239	9.9999991	7.3088239	12.6911752
8	7.3668157	9.9999988	7.3668169	12.6331831
9	7.4179681	9.9999985	7.4179696	12.5820304
10	7.4637255	9.9999982	7.4637273	12.5367207
11	7.5051281	9.9999978	7.5051203	12.4948797
12	7.5429065	9.9999974	7.5429091	12.4570909
13	7.5776684	9.9999969	7.5776713	12.4223285
14	7.6098530	9.9999964	7.6098566	12.3901434
15	7.6398160	9.9999959	7.6398201	12.3601799
16	7.6678445	9.9999953	7.6678492	12.3322700
17	7.6941733	9.9999947	7.6941786	12.3058214
18	7.7189966	9.9999940	7.7190026	12.2809974
19	7.7424775	9.9999934	7.7424841	12.2575159
20	7.7647837	9.9999927	7.7647861	12.2352390
21	7.7859427	9.9999919	7.7859508	12.2140492
22	7.8061458	9.9999911	7.8061547	12.1938453
23	7.8254507	9.9999903	7.8254604	12.1745396
24	7.8439338	9.9999894	7.8439444	12.1560556
25	7.8616613	9.9999885	7.8616738	12.1383262
26	7.8786953	9.9999876	7.8787077	12.1212923
27	7.8950838	9.9999866	7.8950982	12.1049013
28	7.9108793	9.9999856	7.9108938	12.0891062
29	7.9261190	9.9999845	7.9261344	12.0738656
30	7.9408419	9.9999835	7.9408584	12.0591416
	Sine Complement	Sine	Tangent Complement	Tang.
89 Degrees.				

0 Degrees.

Minute	Sine	Sine Complement	Tang.	Tangent Complement.	Minute
30	7.9408419	9.9999831	7.9408384	12.0591416	30
31	7.9550819	9.9999812	7.9550996	12.0449004	29
32	7.9688638	9.9999812	7.9688886	12.0311114	28
33	7.9812334	9.9999800	7.9812534	12.0177466	27
34	7.9951980	9.9999788	7.9952192	12.0047808	26
35	8.0077867	9.9999775	8.0078092	11.9921908	25
36	8.0200207	9.9999762	8.0200445	11.9799555	24
37	8.0319195	9.9999748	8.0319446	11.9680554	23
38	8.0435009	9.9999735	8.0435274	11.9564726	22
39	8.0547814	9.9999721	8.0548094	11.9451906	21
40	8.0657763	9.9999706	8.0658057	11.9341943	20
41	8.0764997	9.9999691	8.0765306	11.9234694	19
42	8.0869646	9.9999676	8.0869970	11.9130030	18
43	8.0971832	9.9999660	8.0972172	11.9027828	17
44	8.1071669	9.9999644	8.1072025	11.8927975	16
45	8.1169262	9.9999628	8.1169634	11.8830366	15
46	8.1264710	9.9999611	8.1265099	11.8734901	14
47	8.1358104	9.9999594	8.1358510	11.8641490	13
48	8.1449532	9.9999577	8.1449956	11.8550044	12
49	8.1539075	9.9999559	8.1539516	11.8460484	11
50	8.1626808	9.9999541	8.1627267	11.8372733	10
51	8.1712804	9.9999522	8.1713282	11.8286718	9
52	8.1797129	9.9999503	8.1797626	11.8202374	8
53	8.1879848	9.9999484	8.1880364	11.8119636	7
54	8.1961020	9.9999464	8.1961556	11.8038444	6
55	8.2040703	9.9999444	8.2041259	11.7958741	5
56	8.2118949	9.9999424	8.2119526	11.7880474	4
57	8.2195811	9.9999403	8.2196408	11.7803592	3
58	8.2271335	9.9999382	8.2271953	11.7728047	2
59	8.2345568	9.9999360	8.2346108	11.7653792	1
60	8.2418553	9.9999338	8.2419215	11.7580785	0
	Sine Complement.	Sine.	Tangent Complement.	Tang.	Minute

89 Degrees.

1 Degree.				
Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.
0	8.2418553	9.9999338	8.2419215	11.7580785
1	8.2490332	9.9999316	8.2491015	11.7508985
2	8.2560943	9.9999294	8.2561649	11.7438351
3	8.2630424	9.9999271	8.2631153	11.7368847
4	8.2698810	9.9999247	8.2699563	11.7300437
5	8.2766136	9.9999224	8.2766912	11.7233088
6	8.2832434	9.9999200	8.2833234	11.7166766
7	8.2897734	9.9999175	8.2898559	11.7101441
8	8.2962067	9.9999150	8.2962917	11.7037083
9	8.3025460	9.9999125	8.3026335	11.6973665
10	8.3087941	9.9999100	8.3088842	11.6911158
11	8.3149536	9.9999074	8.3150462	11.6849538
12	8.3210269	9.9999047	8.3211221	11.6788779
13	8.3270163	9.9999021	8.3271143	11.6728857
14	8.3329243	9.9998994	8.3330249	11.6669751
15	8.3387529	9.9998966	8.3388563	11.6611437
16	8.3445043	9.9998939	8.3446105	11.6553895
17	8.3501805	9.9998911	8.3502895	11.6497105
18	8.3557835	9.9998882	8.3558953	11.6441047
19	8.3613150	9.9998853	8.3614297	11.6385703
20	8.3667769	9.9998824	8.3668945	11.6331055
21	8.3721710	9.9998794	8.3722915	11.6277085
22	8.3774988	9.9998764	8.3776223	11.6223777
23	8.3827620	9.9998734	8.3828886	11.6171114
24	8.3879622	9.9998703	8.3880918	11.6119082
25	8.3931008	9.9998672	8.3932336	11.6067664
26	8.3981793	9.9998641	8.3983152	11.6016848
27	8.4031990	9.9998609	8.4033381	11.5966619
28	8.4081614	9.9998577	8.4083037	11.5916963
29	8.4130676	9.9998544	8.4132132	11.5867868
30	8.4179190	9.9998512	8.4180679	11.5819321
	Sine Complement.	Sine	Tangent Complement.	Tang.

88 Degrees.

I Degree.

Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	Minut.
30	8.4179190	9.9998512	8.4180679	11.5819321	30
31	8.4227168	9.9998473	8.4228690	11.5771310	29
32	8.4274621	9.9998445	8.4276176	11.5723824	28
33	8.4321561	9.9998411	8.4323150	11.5676850	27
34	8.4367999	9.9998376	8.4369622	11.5630378	26
35	8.4413944	9.9998342	8.4415603	11.5584397	25
36	8.4459409	9.9998306	8.4461103	11.5538897	24
37	8.4504402	9.9998271	8.4506131	11.5493869	23
38	8.4548934	9.9998235	8.4550699	11.5449301	22
39	8.4593013	9.9998199	8.4594814	11.5405186	21
40	8.4636649	9.9998162	8.4638486	11.5361514	20
41	8.4679850	9.9998125	8.4681725	11.5318275	19
42	8.4722626	9.9998088	8.4724538	11.5275462	18
43	8.4764984	9.9998050	8.4766933	11.5233067	17
44	8.4806932	9.9998012	8.4808920	11.5191080	16
45	8.4848479	9.9997974	8.4850505	11.5149495	15
46	8.4889632	9.9997935	8.4891696	11.5108304	14
47	8.4930398	9.9997896	8.4932502	11.5067498	13
48	8.4970784	9.9997856	8.4972928	11.5027072	12
49	8.5010798	9.9997817	8.5012982	11.4987018	11
50	8.5050447	9.9997776	8.5052671	11.4947329	10
51	8.5089736	9.9997736	8.5092001	11.4907999	9
52	8.5128673	9.9997695	8.5130978	11.4869022	8
53	8.5167264	9.9997653	8.5169610	11.4830387	7
54	8.5205514	9.9997612	8.5207902	11.4792098	6
55	8.5243430	9.9997570	8.5245860	11.4754140	5
56	8.5281017	9.9997527	8.5283490	11.4716510	4
57	8.5318281	9.9997484	8.5320797	11.4679203	3
58	8.5355228	9.9997441	8.5357787	11.4642213	2
59	8.5391863	9.9997398	8.5394466	11.4605534	1
60	8.5428192	9.9997354	8.5430838	11.4569162	0
	Sine Complement.	Sine	Tangent Complement.	Tang.	

88 Degrees.

2 Degrees.

Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.
0	8.5428192	9.9997354	8.5430838	11.4569162
1	8.5464218	9.9997309	8.5466909	11.4533091
2	8.5499948	9.9997265	8.5502683	11.4497317
3	8.5535386	9.9997220	8.5538166	11.4461834
4	8.5570536	9.9997174	8.5573362	11.4426638
5	8.5605404	9.9997128	8.5608276	11.4391724
6	8.5639994	9.9997082	8.5642912	11.4357088
7	8.5674310	9.9997036	8.5677275	11.4322725
8	8.5708357	9.9996989	8.5711368	11.4288632
9	8.5742139	9.9996942	8.5745197	11.4254803
10	8.5775660	9.9996894	8.5778766	11.4221234
11	8.5808923	9.9996846	8.5812077	11.4187923
12	8.5841933	9.9996798	8.5845136	11.4154864
13	8.5874694	9.9996749	8.5877945	11.4122055
14	8.5907209	9.9996700	8.5910509	11.4089491
15	8.5939483	9.9996650	8.5942832	11.4057168
16	8.5971517	9.9996601	8.5974917	11.4025083
17	8.6003317	9.9996550	8.6006767	11.3993233
18	8.6034886	9.9996500	8.6038386	11.3961614
19	8.6066226	9.9996449	8.6069777	11.3930223
20	8.6097341	9.9996398	8.6100943	11.3899057
21	8.6128235	9.9996346	8.6131889	11.3868111
22	8.6158910	9.9996294	8.6162616	11.3837384
23	8.6189369	9.9996242	8.6193127	11.3806873
24	8.6219616	9.9996189	8.6223427	11.3776573
25	8.6249653	9.9996136	8.6253518	11.3746482
26	8.6279484	9.9996082	8.6283402	11.3716598
27	8.6309111	9.9996028	8.6313083	11.3686917
28	8.6338537	9.9995974	8.6342563	11.3657437
29	8.6367764	9.9995919	8.6371845	11.3628155
30	8.6396796	9.9995865	8.6400931	11.3599059
	Sine Complement	Sine	Tang. Complement.	Tang.

87 Degrees.

2 Degrees.

Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	
30	8.6396796	9.9995865	8.6400931	11.3599069	30
31	8.6425634	9.9995809	8.6429825	11.3570175	29
32	8.6454282	9.9995753	8.6458528	11.3541472	28
33	8.6482742	9.9995697	8.6487044	11.3512956	27
34	8.6511016	9.9995641	8.6515375	11.3484625	26
35	8.6539107	9.9995584	8.6543522	11.3456478	25
36	8.6567017	9.9995527	8.6571490	11.3428510	24
37	8.6594748	9.9995469	8.6599279	11.3400721	23
38	8.6622303	9.9995411	8.6626891	11.3373109	22
39	8.6649684	9.9995353	8.6654331	11.3345669	21
40	8.6676893	9.9995297	8.6681598	11.3318402	20
41	8.6703932	9.9995236	8.6708697	11.3291303	19
42	8.6730804	9.9995176	8.6735628	11.3264372	18
43	8.6757510	9.9995116	8.6762393	11.3237607	17
44	8.6784052	9.9995056	8.6788996	11.3211004	16
45	8.6810433	9.9994996	8.6815437	11.3184563	15
46	8.6836654	9.9994935	8.6841719	11.3158281	14
47	8.6862718	9.9994874	8.6867844	11.3132156	13
48	8.6888625	9.9994812	8.6893813	11.3106187	12
49	8.6914379	9.9994750	8.6919629	11.3080371	11
50	8.6939980	9.9994688	8.6945292	11.3054708	10
51	8.6965431	9.9994625	8.6970806	11.3029194	9
52	8.6990734	9.9994562	8.6996173	11.3003828	8
53	8.7015889	9.9994498	8.7021390	11.2978610	7
54	8.7040899	9.9994435	8.7046465	11.2953535	6
55	8.7065766	9.9994370	8.7071395	11.2928605	5
56	8.7090490	9.9994306	8.7096185	11.2903815	4
57	8.7115075	9.9994241	8.7120834	11.2879166	3
58	8.7139520	9.9994176	8.7145345	11.2854655	2
59	8.7163829	9.9994110	8.7169719	11.2830281	1
60	8.7188002	9.9994044	8.7193958	11.2806042	0

Sine Complement.

Sine

Tangent Complement.

Tang.

Minut.

87 Degrees.

3 Degrees.					
Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	
0	8.7188002	9.9994044	8.7193958	11.2806042	60
1	8.7212040	9.9993978	8.7218063	11.2781937	59
2	8.7235946	9.9993911	8.7242035	11.2757965	58
3	8.7259721	9.9993844	8.7265877	11.2734123	57
4	8.7283366	9.9993776	8.7289589	11.2710411	56
5	8.7306882	9.9993708	8.7313174	11.2686826	55
6	8.7330272	9.9993640	8.7336631	11.2663369	54
7	8.7353535	9.9993572	8.7359964	11.2640036	53
8	8.7376675	9.9993503	8.7383172	11.2616828	52
9	8.7399691	9.9993433	8.7406258	11.2593742	51
10	8.7422586	9.9993364	8.7429222	11.2570778	50
11	8.7445360	9.9993293	8.7452067	11.2547933	49
12	8.7468015	9.9993223	8.7474792	11.2525208	48
13	8.7490553	9.9993152	8.7497400	11.2502600	47
14	8.7512973	9.9993081	8.7519892	11.2480108	46
15	8.7535278	9.9993009	8.7542269	11.2457731	45
16	8.7557469	9.9992938	8.7564531	11.2435469	44
17	8.7579546	9.9992865	8.7586681	11.2413319	43
18	8.7601512	9.9992793	8.7608719	11.2391281	42
19	8.7623366	9.9992720	8.7630647	11.2369353	41
20	8.7645111	9.9992646	8.7652465	11.2347535	40
21	8.7666747	9.9992572	8.7674175	11.2325825	39
22	8.7688275	9.9992498	8.7695777	11.2304223	38
23	8.7709697	9.9992424	8.7717274	11.2282726	37
24	8.7731014	9.9992349	8.7738665	11.2261335	36
25	8.7752226	9.9992274	8.7759952	11.2240048	35
26	8.7773334	9.9992198	8.7781136	11.2218864	34
27	8.7794340	9.9992122	8.7802218	11.2197782	33
28	8.7815244	9.9992046	8.7823199	11.2176801	32
29	8.7836048	9.9991969	8.7844079	11.2155921	31
30	8.7856753	9.9991892	8.7864861	11.2135139	30
	Sine Complement.	Sine.	Tangent Complement.	Tang.	Minut.
86 Degrees.					

3 Degrees.

Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	Minut.
30	8.7856753	9.9991892	8.7864861	11.2135139	30
31	8.7877359	9.9991815	8.7885544	11.2114456	29
32	8.7897867	9.9991737	8.7906130	11.2093870	28
33	8.7918278	9.9991659	8.7926620	11.2073380	27
34	8.7938594	9.9991580	8.7947014	11.2052986	26
35	8.7958814	9.9991501	8.7967313	11.2032687	25
36	8.7978941	9.9991422	8.7987519	11.2012481	24
37	8.7998974	9.9991342	8.8007632	11.1992368	23
38	8.8018915	9.9991262	8.8027653	11.1972347	22
39	8.8038764	9.9991182	8.8047583	11.1952417	21
40	8.8058523	9.9991101	8.8067422	11.1932578	20
41	8.8078192	9.9991020	8.8087172	11.1912828	19
42	8.8097772	9.9990938	8.8106834	11.1893166	18
43	8.8117264	9.9990856	8.8126407	11.1873593	17
44	8.8136668	9.9990774	8.8145894	11.1854106	16
45	8.8155985	9.9990691	8.8165294	11.1834706	15
46	8.8175217	9.9990608	8.8184608	11.1815392	14
47	8.8194363	9.9990525	8.8203838	11.1796162	13
48	8.8213425	9.9990441	8.8222984	11.1777016	12
49	8.8232404	9.9990357	8.8242046	11.1757954	11
50	8.8251299	9.9990273	8.8261026	11.1738974	10
51	8.8270112	9.9990188	8.8279924	11.1720076	9
52	8.8288844	9.9990103	8.8298741	11.1701259	8
53	8.8307495	9.9990017	8.8317478	11.1682522	7
54	8.8326066	9.9989931	8.8336134	11.1663866	6
55	8.8344557	9.9989845	8.8354712	11.1645288	5
56	8.8362969	9.9989758	8.8373211	11.1626789	4
57	8.8381304	9.9989671	8.8391633	11.1608367	3
58	8.8399561	9.9989584	8.8409977	11.1590023	2
59	8.8417741	9.9989496	8.8428245	11.1571755	1
60	8.8435845	9.9989408	8.8446437	11.1553563	0
	Sine Complement.	Sine	Tangent Complement.	Tang.	Minut.

86 Degrees.

4 Degrees.					
Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	
0	8.8435845	9.9989408	8.8446437	11.1553563	60
1	8.8453874	9.9989319	8.8464554	11.1535446	59
2	8.8471827	9.9989230	8.8482597	11.1517403	58
3	8.8489707	9.9989141	8.8500566	11.1499434	57
4	8.8507512	9.9989052	8.8518461	11.1481539	56
5	8.8525245	9.9988962	8.8536283	11.1463717	55
6	8.8542905	9.9988871	8.8554034	11.1445966	54
7	8.8560493	9.9988780	8.8571713	11.1428287	53
8	8.8578010	9.9988689	8.8589321	11.1410679	52
9	8.8595457	9.9988598	8.8606859	11.1393141	51
10	8.8612833	9.9988506	8.8624327	11.1375673	50
11	8.8630139	9.9988414	8.8641725	11.1358275	49
12	8.8647376	9.9988321	8.8659055	11.1340945	48
13	8.8664545	9.9988228	8.8676317	11.1323683	47
14	8.8681646	9.9988135	8.8693511	11.1306489	46
15	8.8698680	9.9988041	8.8710638	11.1289362	45
16	8.8715646	9.9987947	8.8727699	11.1272301	44
17	8.8732546	9.9987853	8.8744694	11.1255306	43
18	8.8749381	9.9987758	8.8761623	11.1238377	42
19	8.8766150	9.9987663	8.8778487	11.1221513	41
20	8.8782854	9.9987567	8.8795286	11.1204714	40
21	8.8799492	9.9987471	8.8812022	11.1187978	39
22	8.8816069	9.9987375	8.8828694	11.1171306	38
23	8.8832581	9.9987278	8.8845303	11.1154697	37
24	8.8849031	9.9987181	8.8861850	11.1138150	36
25	8.8865418	9.9987084	8.8878334	11.1121666	35
26	8.8881743	9.9986986	8.8894757	11.1105243	34
27	8.8898007	9.9986888	8.8911119	11.1088881	33
28	8.8914209	9.9986790	8.8927420	11.1072580	32
29	8.8930351	9.9986691	8.8943660	11.1056340	31
30	8.8946433	9.9986591	8.8959842	11.1040158	30
	Sine Complement.	Sine	Tangent Complement.	Tang.	Minut.
85 Degrees.					

4 Degrees.

60
59
58
57
56
55
54
53
52
51
50
49
48
47
46
45
44
43
42
41
40
39
38
37
36
35
34
33
32
31
30

Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	
30	8.8946433	9.9986591	8.8959842	11.1040158	30
31	8.8962455	9.9986492	8.8975963	11.1024037	29
32	8.8978418	9.9986392	8.8992026	11.1007974	28
33	8.8994322	9.9986292	8.9008030	11.0991970	27
34	8.9010168	9.9986191	8.9023977	11.0976023	26
35	8.9025955	9.9986090	8.9039866	11.0960134	25
36	8.9041685	9.9985988	8.9055697	11.0944303	24
37	8.9057358	9.9985886	8.9071472	11.0928518	23
38	8.9072975	9.9985784	8.9087190	11.0912810	22
39	8.9088535	9.9985682	8.9102853	11.0897147	21
40	8.9104039	9.9985579	8.9118460	11.0881540	20
41	8.9119487	9.9985475	8.9134012	11.0865988	19
42	8.9134881	9.9985372	8.9149509	11.0850491	18
43	8.9150219	9.9985268	8.9164952	11.0835048	17
44	8.9165504	9.9985163	8.9180340	11.0819660	16
45	8.9180734	9.9985058	8.9195675	11.0804325	15
46	8.9195911	9.9984953	8.9210957	11.0789043	14
47	8.9211034	9.9984848	8.9226186	11.0773814	13
48	8.9226105	9.9984742	8.9241363	11.0758637	12
49	8.9241123	9.9984636	8.9256487	11.0743513	11
50	8.9256089	9.9984529	8.9271560	11.0728440	10
51	8.9271003	9.9984422	8.9286581	11.0713419	9
52	8.9285866	9.9984315	7.9301552	11.0698448	8
53	8.9300678	9.9984207	8.9316471	11.0683529	7
54	8.9315439	9.9984099	8.9331340	11.0668660	6
55	8.9330150	9.9983990	8.9346160	11.0653840	5
56	8.9344811	9.9983881	8.9360929	11.0639071	4
57	8.9359422	9.9983772	8.9375650	11.0624350	3
58	8.9373983	9.9983663	8.9390321	11.0609670	2
59	8.9388496	9.9983553	8.9404944	11.0595056	1
60	8.9402960	9.9983442	8.9419518	11.0580482	0
	Sine Complement.	Sine	Tangent Complement.	Tang.	Minut.

85 Degrees.

5 Degrees.					
Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	
0	8.9402960	9.9983442	8.9419518	11.0580482	60
1	8.9417376	9.9983332	8.9434044	11.0565956	59
2	8.9431743	9.9983220	8.9448523	11.0551477	58
3	8.9446063	9.9983109	8.9462954	11.0537046	57
4	8.9460335	9.9982997	8.9477338	11.0522662	56
5	8.9474561	9.9982885	8.9491676	11.0508324	55
6	8.9488739	9.9982772	8.9505967	11.0494033	54
7	8.9502871	9.9982660	8.9520211	11.0479789	53
8	8.9516957	9.9982546	8.9534410	11.0465590	52
9	8.9530996	9.9982433	8.9548564	11.0451436	51
10	8.9544991	9.9982318	8.9562672	11.0437328	50
11	8.9558940	9.9982204	8.9576735	11.0423265	49
12	8.9572843	9.9982089	8.9590754	11.0409246	48
13	8.9586703	9.9981974	8.9604728	11.0395272	47
14	8.9600517	9.9981859	8.9618659	11.0381341	46
15	8.9614288	9.9981743	8.9632545	11.0367455	45
16	8.9628014	9.9981629	8.9646386	11.0353612	44
17	8.9641697	9.9981510	8.9660188	11.0339812	43
18	8.9655337	9.9981393	8.9673944	11.0326056	42
19	8.9668934	9.9981275	8.9687658	11.0312342	41
20	8.9682487	9.9981158	8.9701330	11.0298670	40
21	8.9695999	9.9981040	8.9714959	11.0285041	39
22	8.9709468	9.9980921	8.9728547	11.0271453	38
23	8.9722895	9.9980802	8.9742092	11.0257908	37
24	8.9736280	9.9980683	8.9755597	11.0244403	36
25	8.9749624	9.9980563	8.9769060	11.0230940	35
26	8.9762926	9.9980443	8.9782483	11.0217517	34
27	8.9776188	9.9980323	8.9795865	11.0204135	33
28	8.9789408	9.9980202	8.9809206	11.0190794	32
29	8.9802589	9.9980081	8.9822507	11.0177493	31
30	8.9815729	9.9979960	8.9835769	11.0164231	30
	Sine Complement	Sine	Tang. Complement.	Tang.	Minut.

5 Degrees.

Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	Minut.
30	8.9815729	9.9979960	8.9835269	11.0164231	30
31	8.9818829	9.9979838	8.9848991	11.0151009	29
32	8.9841889	9.9979716	8.9862173	11.0137827	28
33	8.9854910	9.9979593	8.9875317	11.0124683	27
34	8.9867891	9.9979470	8.9888421	11.0111579	26
35	8.9880834	9.9979347	8.9901487	11.0098513	25
36	8.9893737	9.9979223	8.9914514	11.0085486	24
37	8.9906602	9.9979099	8.9927503	11.0072497	23
38	8.9919429	9.9978975	8.9940454	11.0059546	22
39	8.9932217	9.9978850	8.9953367	11.0046633	21
40	8.9944968	9.9978725	8.9966243	11.0033757	20
41	8.9957681	9.9978599	8.9979081	11.0020916	19
42	8.9970356	9.9978473	8.9991883	11.0008117	18
43	8.9982994	9.9978347	9.0004647	10.9995353	17
44	8.9995595	9.9978220	9.0017375	10.9982625	16
45	9.0008160	9.9978093	9.0030066	10.9969934	15
46	9.0020687	9.9977966	9.0042721	10.9957279	14
47	9.0033179	9.9977838	9.0055340	10.9944660	13
48	9.0045634	9.9977710	9.0067924	10.9932076	12
49	9.0058053	9.9977582	9.0080471	10.9919529	11
50	9.0070436	9.9977453	9.0092984	10.9907016	10
51	9.0082784	9.9977323	9.0105461	10.9894539	9
52	9.0095096	9.9977194	9.0117903	10.9882109	8
53	9.0107374	9.9977064	9.0130310	10.9869690	7
54	9.0119616	9.9976933	9.0142682	10.9857318	6
55	9.0131823	9.9976803	9.0155021	10.9844979	5
56	9.0143996	9.9976672	9.0167325	10.9832675	4
57	9.0156135	9.9976540	9.0179594	10.9820406	3
58	9.0168239	9.9976408	9.0191831	10.9808169	2
59	9.0180309	9.9976276	9.0204033	10.9795967	1
60	9.0192346	9.9976143	9.0216202	10.9783798	0
	Sine Complement.	Sine	Tangent Complement	Tang.	Minut.

84 Degrees.

6 Degrees.

Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	Minut.
0	9.0192346	9.9976143	9.0216203	10.9783798	60
1	9.0204348	9.9976011	9.0218338	10.9771662	59
2	9.0216318	9.9975877	9.0240441	10.9759559	58
3	9.0228254	9.9975743	9.0252510	10.9747490	57
4	9.0240157	9.9975609	9.0264548	10.9735452	56
5	9.0252027	9.9975475	9.0276552	10.9723448	55
6	9.0263865	9.9975340	9.0288524	10.9711476	54
7	9.0275669	9.9975205	9.0300464	10.9699536	53
8	9.0287442	9.9975069	9.0312353	10.9687627	52
9	9.0299182	9.9974933	9.0324249	10.9675751	51
10	9.0310890	9.9974797	9.0336093	10.9663907	50
11	9.0322567	9.9974660	9.0347906	10.9652094	49
12	9.0334212	9.9974523	9.0359688	10.9640312	48
13	9.0345825	9.9974386	9.0371439	10.9628561	47
14	9.0357407	9.9974248	9.0383152	10.9616841	46
15	9.0368958	9.9974110	9.0394848	10.9605152	45
16	9.0380477	9.9973971	9.0406506	10.9593494	44
17	9.0391966	9.9973833	9.0418134	10.9581866	43
18	9.0403424	9.9973693	9.0429731	10.9570269	42
19	9.0414852	9.9973554	9.0441299	10.9558701	41
20	9.0426249	9.9973414	9.0452836	10.9547164	40
21	9.0437617	9.9973273	9.0464643	10.9535657	39
22	9.0448954	9.9973132	9.0475821	10.9524179	38
23	9.0460262	9.9972991	9.0487270	10.9512730	37
24	9.0471538	9.9972850	9.0498689	10.9501312	36
25	9.0482786	9.9972708	9.0510078	10.9489922	35
26	9.0494005	9.9972566	9.0521439	10.9478561	34
27	9.0505194	9.9972423	9.0532771	10.9467229	33
28	9.0516354	9.9972280	9.0544074	10.9455926	32
29	9.0527485	9.9972137	9.0555349	10.9444651	31
30	9.0538588	9.9971993	9.0566595	10.9433405	30
	Sine Complement.	Sine	Tangent Complement.	Tang.	Minut.

83 Degrees.

6 Degrees.

Minut.	Sine		Tang.		Minut.
	Sine	Sine Complement.	Tang.	Tangent Complement.	
1	9.0538588	9.9971993	9.0566195	10.9433405	30
2	9.0549661	9.9971849	9.0577813	10.9422187	29
3	9.0560706	9.9971704	9.0589002	10.9410998	28
4	9.0571723	9.9971559	9.0600164	10.9399836	27
5	9.0582711	9.9971414	9.0611297	10.9388703	26
6	9.0593671	9.9971268	9.0622403	10.9377597	25
7	9.0604604	9.9971122	9.0633482	10.9366518	24
8	9.0615509	9.9970976	9.0644533	10.9355467	23
9	9.0626386	9.9970829	9.0655556	10.9344444	22
10	9.0637235	9.9970682	9.0666553	10.9333447	21
11	9.0648057	9.9970535	9.0677522	10.9322478	20
12	9.0658851	9.9970387	9.0688465	10.9311535	19
13	9.0669619	9.9970239	9.0699381	10.9300619	18
14	9.0680360	9.9970090	9.0710270	10.9289730	17
15	9.0691074	9.9969941	9.0721133	10.9278867	16
16	9.0701761	9.9969792	9.0731969	10.9268031	15
17	9.0712421	9.9969642	9.0742779	10.9257221	14
18	9.0723055	9.9969492	9.0753563	10.9246437	13
19	9.0733663	9.9969342	9.0764321	10.9235679	12
20	9.0744244	9.9969191	9.0775053	10.9224947	11
21	9.0754799	9.9969040	9.0785760	10.9214240	10
22	9.0765329	9.9968888	9.0796441	10.9203559	9
23	9.0775832	9.9968736	9.0807096	10.9192904	8
24	9.0786310	9.9968584	9.0817726	10.9182274	7
25	9.0796762	9.9968431	9.0828331	10.9171669	6
26	9.0807189	9.9968278	9.0838911	10.9161089	5
27	9.0817590	9.9968125	9.0849466	10.9150534	4
28	9.0827966	9.9967971	9.0859996	10.9140004	3
29	9.0838317	9.9967817	9.0870501	10.9129499	2
30	9.0848643	9.9967662	9.0880981	10.9119019	1
31	9.0858945	9.9967507	9.0891438	10.9108562	0
	Sine Complement.	Sine	Tangent Complement.	Tang.	

83 Degrees.

7 Degrees.

Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	Minut.
0	9.0858945	9.9967507	9.0891438	10.9108562	60
1	9.0869221	9.9967352	9.0901869	10.9098131	59
2	9.0879473	9.9967196	9.0912277	10.9087723	58
3	9.0889700	9.9967040	9.0922660	10.9077340	57
4	9.0899903	9.9966884	9.0933020	10.9066980	56
5	9.0910082	9.9966727	9.0943355	10.9056645	55
6	9.0920237	9.9966570	9.0953669	10.9046333	54
7	9.0930367	9.9966412	9.0963955	10.9036045	53
8	9.0940474	9.9966254	9.0974219	10.9025781	52
9	9.0950556	9.9966096	9.0984460	10.9015540	51
10	9.0960615	9.9965937	9.0994678	10.9005322	50
11	9.0970651	9.9965778	9.1004872	10.8995128	49
12	9.0980662	9.9965619	9.1015044	10.8984956	48
13	9.0990651	9.9965459	9.1025192	10.8974808	47
14	9.1000616	9.9965299	9.1035317	10.8964683	46
15	9.1010558	9.9965138	9.1045420	10.8954580	45
16	9.1020477	9.9964977	9.1055500	10.8944500	44
17	9.1030373	9.9964816	9.1065557	10.8934443	43
18	9.1040246	9.9964655	9.1075591	10.8924406	42
19	9.1050096	9.9964493	9.1085604	10.8914386	41
20	9.1059924	9.9964330	9.1095594	10.8904406	40
21	9.1069729	9.9964167	9.1105562	10.8894438	39
22	9.1079512	9.9964004	9.1115508	10.8884492	38
23	9.1089272	9.9963841	9.1125431	10.8874569	37
24	9.1099010	9.9963677	9.1135333	10.8864667	36
25	9.1108726	9.9963513	9.1145213	10.8854787	35
26	9.1118420	9.9963348	9.1155072	10.8844928	34
27	9.1128092	9.9963183	9.1164909	10.8835091	33
28	9.1137742	9.9963018	9.1174724	10.8825276	32
29	9.1147370	9.9962852	9.1184518	10.8815482	31
30	9.1156977	9.9962686	9.1194291	10.8805709	30
	Sine Complement.	Sine	Tangent Complement.	Tang.	Minut.

82 Degrees.

7 Degrees.

Minute	Sine	Sine Complement.	Tang.	Tangent Complement.	Minute
	Sine Complement.	Sine	Tangent Complement.	Tang.	
30	9.1156977	9.9962686	9.1194291	10.8805709	30
31	9.1166562	9.9962519	9.1204043	10.8795957	29
32	9.1176125	9.9962351	9.1213773	10.8786227	28
33	9.1185667	9.9962183	9.1223482	10.8776518	27
34	9.1195188	9.9962017	9.1233171	10.8766829	26
35	9.1204688	9.9961849	9.1242839	10.8757161	25
36	9.1214167	9.9961681	9.1252486	10.8747514	24
37	9.1223624	9.9961512	9.1262112	10.8737888	23
38	9.1233061	9.9961343	9.1271718	10.8728282	22
39	9.1242477	9.9961174	9.1281303	10.8718697	21
40	9.1251872	9.9961004	9.1290868	10.8709132	20
41	9.1261247	9.9960834	9.1300413	10.8699587	19
42	9.1270600	9.9960663	9.1309937	10.8690063	18
43	9.1279934	9.9960491	9.1319442	10.8680558	17
44	9.1289247	9.9960321	9.1328926	10.8671074	16
45	9.1298539	9.9960149	9.1338391	10.8661609	15
46	9.1307812	9.9959977	9.1347835	10.8652165	14
47	9.1317064	9.9959804	9.1357260	10.8642740	13
48	9.1326297	9.9959631	9.1366665	10.8633335	12
49	9.1335509	9.9959458	9.1376051	10.8623949	11
50	9.1344702	9.9959284	9.1385417	10.8614583	10
51	9.1353875	9.9959111	9.1394764	10.8605236	9
52	9.1363028	9.9958936	9.1404092	10.8595908	8
53	9.1372161	9.9958761	9.1413400	10.8586600	7
54	9.1381275	9.9958586	9.1422689	10.8577311	6
55	9.1390370	9.9958411	9.1431959	10.8568041	5
56	9.1399445	9.9958235	9.1441210	10.8558790	4
57	9.1408501	9.9958059	9.1450442	10.8549558	3
58	9.1417537	9.9957882	9.1459655	10.8540345	2
59	9.1426555	9.9957705	9.1468850	10.8531150	1
60	9.1435553	9.9957528	9.1478025	10.8521975	0
	Sine Complement.	Sine	Tangent Complement.	Tang.	Minute

82 Degree.

8 Degrees.

Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	Minut.
0	9.1435333	9.9957528	9.1478025	10.8511975	60
1	9.1444531	9.9957350	9.1487182	10.8512818	59
2	9.1453493	9.9957172	9.1496321	10.8513679	58
3	9.1462435	9.9956993	9.1505441	10.8494559	57
4	9.1471338	9.9956815	9.1514543	10.8485457	56
5	9.1480262	9.9956635	9.1523627	10.8476373	55
6	9.1489148	9.9956456	9.1532693	10.8467308	54
7	9.1498015	9.9956276	9.1541739	10.8458261	53
8	9.1506864	9.9956095	9.1550769	10.8449232	52
9	9.1515694	9.9955915	9.1559780	10.8440220	51
10	9.1524507	9.9955734	9.1568773	10.8431227	50
11	9.1533301	9.9955552	9.1577748	10.8422252	49
12	9.1542076	9.9955370	9.1586706	10.8413294	48
13	9.1550834	9.9955188	9.1595646	10.8404354	47
14	9.1559574	9.9955005	9.1604569	10.8395432	46
15	9.1568296	9.9954822	9.1613473	10.8386527	45
16	9.1577000	9.9954639	9.1622361	10.8377639	44
17	9.1585686	9.9954455	9.1631231	10.8368769	43
18	9.1594354	9.9954271	9.1640083	10.8359917	42
19	9.1603009	9.9954087	9.1648919	10.8351081	41
20	9.1611639	9.9953902	9.1657737	10.8342263	40
21	9.1620254	9.9953717	9.1666538	10.8333462	39
22	9.1628853	9.9953531	9.1675322	10.8324678	38
23	9.1637434	9.9953345	9.1684089	10.8315911	37
24	9.1645998	9.9953159	9.1692839	10.8307162	36
25	9.1654542	9.9952973	9.1701572	10.8298428	35
26	9.1663074	9.9952785	9.1710289	10.8289711	34
27	9.1671586	9.9952597	9.1718989	10.8281011	33
28	9.1680081	9.9952409	9.1727672	10.8272328	32
29	9.1688559	9.9952221	9.1736338	10.8263662	31
30	9.1697021	9.9952033	9.1744988	10.8255012	30
	Sine Complement.	Sine	Tangent Complement.	Tang.	Minut.

81 Degrees.

8 Degrees.

Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	Minut.
30	9.1697021	9.9951033	9.1744988	10.8255012	30
31	9.1705465	9.9951844	9.1753622	10.8246378	29
32	9.1713893	9.9951654	9.1762139	10.8237761	28
33	9.1722305	9.9951464	9.1770840	10.8229260	27
34	9.1730699	9.9951274	9.1779425	10.8220575	26
35	9.1739077	9.9951084	9.1787993	10.8212007	25
36	9.1747439	9.9950893	9.1796546	10.8203454	24
37	9.1755784	9.9950702	9.1805082	10.8194918	23
38	9.1764112	9.9950510	9.1813602	10.8186398	22
39	9.1772429	9.9950318	9.1822106	10.8177894	21
40	9.1780721	9.9950126	9.1830595	10.8169405	20
41	9.1789001	9.9949933	9.1839068	10.8160932	19
42	9.1797265	9.9949740	9.1847525	10.8152475	18
43	9.1805512	9.9949546	9.1855966	10.8144034	17
44	9.1813744	9.9949352	9.1864392	10.8135608	16
45	9.1821960	9.9949158	9.1872802	10.8127198	15
46	9.1830160	9.9948964	9.1881196	10.8118804	14
47	9.1838344	9.9948769	9.1889575	10.8110425	13
48	9.1846512	9.9948573	9.1897939	10.8102061	12
49	9.1854665	9.9948377	9.1906287	10.8093713	11
50	9.1862802	9.9948181	9.1914621	10.8085379	10
51	9.1870923	9.9947985	9.1922939	10.8077061	9
52	9.1879029	9.9947788	9.1931241	10.8068759	8
53	9.1887120	9.9947591	9.1939529	10.8060471	7
54	9.1895195	9.9947393	9.1947802	10.8052198	6
55	9.1903254	9.9947195	9.1956059	10.8043941	5
56	9.1911299	9.9946997	9.1964302	10.8035698	4
57	9.1919328	9.9946798	9.1972530	10.8027470	3
58	9.1927342	9.9946599	9.1980743	10.8019257	2
59	9.1935341	9.9946399	9.1988941	10.8011059	1
60	9.1943324	9.9946199	9.1997125	10.8002875	0
	Sine Complement.	Sine.	Tangent Complement.	Tang.	Minut.

81 Degrees.

9 Degrees.

Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	Minut.
0	9.1943324	9.9946195	9.1997125	10.8002875	90
1	9.1951293	9.9945995	9.2005294	10.7994706	89
2	9.1959247	9.9945798	9.2013449	10.7986551	88
3	9.1967186	9.9945597	9.2021588	10.7978411	87
4	9.1975110	9.9945396	9.2029714	10.7970286	86
5	9.1983019	9.9945194	9.2037825	10.7962175	85
6	9.1990913	9.9944992	9.2045922	10.7954078	84
7	9.1998793	9.9944789	9.2054004	10.7945996	83
8	9.2006658	9.9944587	9.2062072	10.7937928	82
9	9.2014509	9.9944383	9.2070126	10.7929874	81
10	9.2022345	9.9944180	9.2078165	10.7921832	80
11	9.2030167	9.9943975	9.2086191	10.7913809	79
12	9.2037974	9.9943771	9.2094203	10.7905797	78
13	9.2045766	9.9943566	9.2102200	10.7897800	77
14	9.2053545	9.9943361	9.2110184	10.7889816	76
15	9.2061309	9.9943156	9.2118153	10.7881847	75
16	9.2069059	9.9942950	9.2126109	10.7873891	74
17	9.2076795	9.9942743	9.2134051	10.7865949	73
18	9.2084516	9.9942537	9.2141980	10.7858020	72
19	9.2092224	9.9942330	9.2149894	10.7850106	71
20	9.2099917	9.9942122	9.2157795	10.7842205	70
21	9.2107597	9.9941914	9.2165683	10.7834317	69
22	9.2115263	9.9941706	9.2173556	10.7826444	68
23	9.2122914	9.9941498	9.2181417	10.7818583	67
24	9.2130552	9.9941289	9.2189264	10.7810736	66
25	9.2138176	9.9941079	9.2197097	10.7802903	65
26	9.2145787	9.9940870	9.2204917	10.7795083	64
27	9.2153384	9.9940659	9.2212724	10.7787276	63
28	9.2160967	9.9940449	9.2220518	10.7779482	62
29	9.2168536	9.9940238	9.2228298	10.7771702	61
30	9.2176092	9.9940027	9.2236065	10.7763935	60
	Sine Complement.	Sine	Tangent Complement.	Tang.	Minut.
80 Degrees.					90

9 Degrees.

Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	Minut.
30	9.2176092	9.9940027	9.2236065	10.7763935	30
31	9.2183635	9.9939815	9.2243819	10.7756181	29
32	9.2191164	9.9939603	9.2251561	10.7748439	28
33	9.2198680	9.9939391	9.2259289	10.7740711	27
34	9.2206182	9.9939178	9.2267004	10.7732996	26
35	9.2213671	9.9938965	9.2274706	10.7725294	25
36	9.2221147	9.9938752	9.2282395	10.7717605	24
37	9.2228609	9.9938538	9.2290071	10.7709929	23
38	9.2236059	9.9938324	9.2297735	10.7702265	22
39	9.2243495	9.9938109	9.2305386	10.7694614	21
40	9.2250918	9.9937894	9.2313024	10.7686976	20
41	9.2258328	9.9937679	9.2320650	10.7679350	19
42	9.2265725	9.9937463	9.2328262	10.7671738	18
43	9.2273110	9.9937247	9.2335863	10.7664137	17
44	9.2280481	9.9937030	9.2343451	10.7656549	16
45	9.2287839	9.9936813	9.2351026	10.7648974	15
46	9.2295185	9.9936596	9.2358589	10.7641411	14
47	9.2302518	9.9936378	9.2366139	10.7633861	13
48	9.2309838	9.9936160	9.2373678	10.7626322	12
49	9.2317145	9.9935942	9.2381203	10.7618797	11
50	9.2324440	9.9935723	9.2388717	10.7611283	10
51	9.2331722	9.9935504	9.2396218	10.7603782	9
52	9.2338992	9.9935285	9.2403708	10.7596292	8
53	9.2346249	9.9935065	9.2411185	10.7588815	7
54	9.2353494	9.9934844	9.2418650	10.7581350	6
55	9.2360726	9.9934624	9.2426103	10.7573897	5
56	9.2367946	9.9934403	9.2433543	10.7566457	4
57	9.2375153	9.9934181	9.2440972	10.7559028	3
58	9.2382349	9.9933959	9.2448389	10.7551611	2
59	9.2389532	9.9933737	9.2455794	10.7544206	1
60	9.2396702	9.9933515	9.2463188	10.7536812	0
	Sine Complement	Sine	Tangent Complement.	Tang.	Minut.

80 Degrees.

10 Degrees.

Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	Minut.
0	9.2396702	9.9933515	9.2463188	10.7536812	60
1	9.2403861	9.9933292	9.2470569	10.7529431	59
2	9.2411007	9.9933068	9.2477939	10.7522061	58
3	9.2418141	9.9932845	9.2485297	10.7514703	57
4	9.2425264	9.9932621	9.2492643	10.7507357	56
5	9.2432374	9.9932396	9.2499978	10.7500022	55
6	9.2439472	9.9932171	9.2507301	10.7492699	54
7	9.2446558	9.9931946	9.2514612	10.7485388	53
8	9.2453632	9.9931720	9.2521912	10.7478080	52
9	9.2460695	9.9931494	9.2529200	10.7470800	51
10	9.2467746	9.9931268	9.2536477	10.7463523	50
11	9.2474784	9.9931041	9.2543743	10.7456259	49
12	9.2481812	9.9930814	9.2550997	10.7449003	48
13	9.2488827	9.9930587	9.2558240	10.7441760	47
14	9.2495830	9.9930359	9.2565472	10.7434528	46
15	9.2502822	9.9930131	9.2572691	10.7427308	45
16	9.2509803	9.9929902	9.2579901	10.7420099	44
17	9.2516772	9.9929673	9.2587099	10.7412901	43
18	9.2523729	9.9929444	9.2594285	10.7405715	42
19	9.2530675	9.9929214	9.2601461	10.7398539	41
20	9.2537609	9.9928984	9.2608625	10.7391375	40
21	9.2544532	9.9928753	9.2615779	10.7384221	39
22	9.2551444	9.9928522	9.2622921	10.7377079	38
23	9.2558344	9.9928291	9.2630053	10.7369947	37
24	9.2565233	9.9928059	9.2637173	10.7362817	36
25	9.2572110	9.9927827	9.2644283	10.7355717	35
26	9.2578977	9.9927595	9.2651382	10.7348618	34
27	9.2585832	9.9927362	9.2658470	10.7341530	33
28	9.2592676	9.9927129	9.2665547	10.7334453	32
29	9.2599509	9.9926895	9.2672613	10.7327387	31
30	9.2606330	9.9926661	9.2679669	10.7320331	30
	Sine Complement.	Sine	Tangent Complement.	Tang.	Minut.

79 Degrees.

10 Degrees.

Minut.	Sine	Sine Complément.	Tang.	Tangent Complément.	Minut.
30	9.2606330	9.9926661	9.2679669	10.7320331	30
31	9.2613141	9.9926427	9.2686714	10.7313286	29
32	9.2619941	9.9926192	9.2693749	10.7306151	28
33	9.2626729	9.9925957	9.2700772	10.7299228	27
34	9.2633507	9.9925722	9.2707786	10.7292214	26
35	9.2640274	9.9925486	9.2714788	10.7285212	25
36	9.2647030	9.9925250	9.2721780	10.7278220	24
37	9.2653795	9.9925013	9.2728762	10.7271238	23
38	9.2660509	9.9924776	9.2735733	10.7264267	22
39	9.2667232	9.9924539	9.2742694	10.7257306	21
40	9.2673944	9.9924301	9.2749644	10.7250356	20
41	9.2680647	9.9924063	9.2756584	10.7243416	19
42	9.2687338	9.9923824	9.2763514	10.7236486	18
43	9.2694019	9.9923585	9.2770434	10.7229566	17
44	9.2700689	9.9923346	9.2777343	10.7222657	16
45	9.2707348	9.9923106	9.2784242	10.7215758	15
46	9.2713997	9.9922866	9.2791131	10.7208869	14
47	9.2720635	9.9922626	9.2798009	10.7201991	13
48	9.2727263	9.9922385	9.2804878	10.7195122	12
49	9.2733880	9.9922144	9.2811736	10.7188264	11
50	9.2740487	9.9921902	9.2818585	10.7181415	10
51	9.2747083	9.9921660	9.2825423	10.7174577	9
52	9.2753669	9.9921418	9.2832251	10.7167749	8
53	9.2760245	9.9921175	9.2839070	10.7160930	7
54	9.2766811	9.9920932	9.2845878	10.7154122	6
55	9.2773368	9.9920689	9.2852677	10.7147323	5
56	9.2779911	9.9920445	9.2859466	10.7140534	4
57	9.2786449	9.9920201	9.2866245	10.7133755	3
58	9.2792970	9.9919956	9.2873014	10.7126986	2
59	9.2799484	9.9919711	9.2879773	10.7120227	1
60	9.2805988	9.9919466	9.2886522	10.7113477	0
	Sine Complément.	Sine	Tangent Complément.	Tang.	Minut.

79 Degrees.

Minut.	11 Degrees.				Minut.
	Sine	Sine Complement.	Tang.	Tangent Complement.	
0	9.2803988	9.9919466	9.2886523	10.7113477	60
1	9.2811483	9.9919220	9.2893262	10.7106737	59
2	9.2818967	9.9918974	9.2899993	10.7100007	58
3	9.2825441	9.9918727	9.2906713	10.7093287	57
4	9.2831905	9.9918480	9.2913424	10.7086576	56
5	9.2838359	9.9918233	9.2920116	10.7079874	55
6	9.2844803	9.9917986	9.2926817	10.7073183	54
7	9.2851237	9.9917737	9.2933500	10.7066500	53
8	9.2857661	9.9917489	9.2940172	10.7059818	52
9	9.2864076	9.9917240	9.2946836	10.7053164	51
10	9.2870480	9.9916991	9.2953489	10.7046511	50
11	9.2876873	9.9916741	9.2960134	10.7039866	49
12	9.2883260	9.9916492	9.2966769	10.7033231	48
13	9.2889636	9.9916241	9.2973395	10.7026605	47
14	9.2896001	9.9915990	9.2980011	10.7019989	46
15	9.2902357	9.9915739	9.2986618	10.7013382	45
16	9.2908704	9.9915488	9.2993216	10.7006784	44
17	9.2915040	9.9915236	9.2999804	10.7000196	43
18	9.2921367	9.9914984	9.3006383	10.6993617	42
19	9.2927685	9.9914731	9.3012954	10.6987046	41
20	9.2933993	9.9914478	9.3019514	10.6980486	40
21	9.2940291	9.9914225	9.3026066	10.6973934	39
22	9.2946580	9.9913971	9.3032609	10.6967391	38
23	9.2952859	9.9913717	9.3039143	10.6960857	37
24	9.2959129	9.9913462	9.3045667	10.6954333	36
25	9.2965390	9.9913207	9.3052183	10.6947817	35
26	9.2971641	9.9912952	9.3058689	10.6941311	34
27	9.2977883	9.9912696	9.3065187	10.6934813	33
28	9.2984116	9.9912440	9.3071675	10.6928325	32
29	9.2990339	9.9912184	9.3078155	10.6921845	31
30	9.2996553	9.9911927	9.3084626	10.6915374	30
	Sine Complement.	Sine	Tangent Complement.	Tang.	Minut.

78 Degrees.

11 Degrees.

Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	Minut.
30	9.2996553	9.9911927	9.3084626	10.6915374	30
31	9.3002758	9.9911670	9.3091088	10.6908912	29
32	9.3008953	9.9911412	9.3097541	10.6902459	28
33	9.3015140	9.9911154	9.3103985	10.6896015	27
34	9.3021317	9.9910896	9.3110421	10.6889579	26
35	9.3027485	9.9910637	9.3116848	10.6883152	25
36	9.3033644	9.9910378	9.3123266	10.6876734	24
37	9.3039794	9.9910119	9.3129675	10.6870325	23
38	9.3045934	9.9909859	9.3136076	10.6863924	22
39	9.3052066	9.9909598	9.3142468	10.6857532	21
40	9.3058189	9.9909338	9.3148851	10.6851149	20
41	9.3064303	9.9909077	9.3155226	10.6844774	19
42	9.3070407	9.9908815	9.3161592	10.6838408	18
43	9.3076503	9.9908553	9.3167950	10.6832050	17
44	9.3082590	9.9908291	9.3174299	10.6825701	16
45	9.3088668	9.9908029	9.3180640	10.6819360	15
46	9.3094737	9.9907766	9.3186972	10.6813028	14
47	9.3100798	9.9907502	9.3193295	10.6806705	13
48	9.3106849	9.9907239	9.3199611	10.6800389	12
49	9.3112892	9.9906974	9.3205918	10.6794082	11
50	9.3118926	9.9906710	9.3212216	10.6787784	10
51	9.3124951	9.9906445	9.3218506	10.6781494	9
52	9.3130968	9.9906180	9.3224788	10.6775212	8
53	9.3136976	9.9905914	9.3231061	10.6768939	7
54	9.3142975	9.9905648	9.3237327	10.6762673	6
55	9.3148965	9.9905382	9.3243584	10.6756416	5
56	9.3154947	9.9905115	9.3249832	10.6750168	4
57	9.3160921	9.9904848	9.3256073	10.6743927	3
58	9.3166885	9.9904580	9.3262305	10.6737695	2
59	9.3172841	9.9904312	9.3268529	10.6731471	1
60	9.3178789	9.9904044	9.3274745	10.6725255	0
Sine Complement.	Sine	Tangent Complement.	Tang.		Minut.

78 Degrees.

12 Degrees.				
Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.
0	9.3178789	9.9904044	9.3274745	10.6725255
1	9.3184728	9.9903775	9.3280953	10.6719047
2	9.3190659	9.9903506	9.3287153	10.6712847
3	9.3196581	9.9903237	9.3293345	10.6706655
4	9.3202495	9.9902967	9.3299528	10.6700472
5	9.3208400	9.9902697	9.3305704	10.6694296
6	9.3214297	9.9902426	9.3311872	10.6688128
7	9.3220186	9.9902155	9.3318031	10.6681969
8	9.3226066	9.9901883	9.3324183	10.6675817
9	9.3231938	9.9901612	9.3330327	10.6669673
10	9.3237802	9.9901339	9.3336463	10.6663537
11	9.3243657	9.9901067	9.3342591	10.6657409
12	9.3249505	9.9900794	9.3348711	10.6651289
13	9.3255344	9.9900521	9.3354823	10.6645177
14	9.3261174	9.9900247	9.3360927	10.6639073
15	9.3266997	9.9899973	9.3367024	10.6632976
16	9.3272811	9.9899698	9.3373113	10.6626887
17	9.3278617	9.9899423	9.3379194	10.6620806
18	9.3284416	9.9899148	9.3385267	10.6614733
19	9.3290206	9.9898873	9.3391333	10.6608667
20	9.3295988	9.9898597	9.3397391	10.6602609
21	9.3301761	9.9898320	9.3403441	10.6596559
22	9.3307527	9.9898043	9.3409484	10.6590516
23	9.3313285	9.9897766	9.3415519	10.6584481
24	9.3319035	9.9897489	9.3421546	10.6578454
25	9.3324777	9.9897211	9.3427566	10.6572434
26	9.3330511	9.9896932	9.3433578	10.6566422
27	9.3336237	9.9896654	9.3439583	10.6560417
28	9.3341955	9.9896374	9.3445580	10.6554420
29	9.3347665	9.9896093	9.3451570	10.6548430
30	9.3353368	9.9895815	9.3457552	10.6542448
Sine Complement.	Sine	Tangent Complement.	Tang.	Minut.
17 Degrees.				

12 Degrees.

Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	
30	9.3353368	9.9895815	9.3457552	10.6542448	30
31	9.3359061	9.9895535	9.3463527	10.6536473	29
32	9.3364749	9.9895254	9.3469494	10.6530506	28
33	9.3370428	9.9894973	9.3475454	10.6524546	27
34	9.3376099	9.9894692	9.3481407	10.6518593	26
35	9.3381762	9.9894410	9.3487352	10.6512648	25
36	9.3387418	9.9894128	9.3493290	10.6506710	24
37	9.3393065	9.9893845	9.3499220	10.6500780	23
38	9.3398706	9.9893562	9.3505143	10.6494857	22
39	9.3404338	9.9893279	9.3511059	10.6488941	21
40	9.3409963	9.9892995	9.3516968	10.6483032	20
41	9.3415580	9.9892711	9.3522869	10.6477131	19
42	9.3421190	9.9892427	9.3528763	10.6471237	18
43	9.3426792	9.9892142	9.3534650	10.6465350	17
44	9.3432386	9.9891856	9.3540530	10.6459470	16
45	9.3437973	9.9891571	9.3546402	10.6453598	15
46	9.3443552	9.9891285	9.3552267	10.6447733	14
47	9.3449124	9.9890998	9.3558126	10.6441874	13
48	9.3454688	9.9890711	9.3563977	10.6436023	12
49	9.3460245	9.9890424	9.3569821	10.6430179	11
50	9.3465794	9.9890137	9.3575658	10.6424342	10
51	9.3471336	9.9889849	9.3581487	10.6418513	9
52	9.3476870	9.9889560	9.3587310	10.6412690	8
53	9.3482397	9.9889271	9.3593126	10.6406874	7
54	9.3487917	9.9888982	9.3598935	10.6401065	6
55	9.3493429	9.9888693	9.3604736	10.6395264	5
56	9.3498934	9.9888403	9.3610531	10.6389469	4
57	9.3504432	9.9888113	9.3616319	10.6383681	3
58	9.3509922	9.9887822	9.3622100	10.6377900	2
59	9.3515405	9.9887531	9.3627874	10.6372126	1
60	9.3520880	9.9887239	9.3633641	10.6366359	0
	Sine Complement.	Sine	Tangent Complement.	Tang.	Minut.

77 Degrees.

13 Degrees.					
Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	
0	9.3520880	9.9887239	9.3633641	10.6366359	60
1	9.3526349	9.9886947	9.3639401	10.6360599	59
2	9.3531810	9.9886655	9.3645155	10.6354845	58
3	9.3537264	9.9886363	9.3650901	10.6349099	57
4	9.3542710	9.9886070	9.3656641	10.6343359	56
5	9.3548150	9.9885776	9.3662374	10.6337626	55
6	9.3553582	9.9885482	9.3668100	10.6331900	54
7	9.3559007	9.9885188	9.3673819	10.6326181	53
8	9.3564426	9.9884894	9.3679532	10.6320468	52
9	9.3569836	9.9884599	9.3685238	10.6314762	51
10	9.3575240	9.9884303	9.3690937	10.6309063	50
11	9.3580637	9.9884008	9.3696629	10.6303371	49
12	9.3586027	9.9883712	9.3702315	10.6297685	48
13	9.3591409	9.9883415	9.3707994	10.6291906	47
14	9.3596785	9.9883118	9.3713667	10.6286333	46
15	9.3602154	9.9882821	9.3719333	10.6280667	45
16	9.3607515	9.9882523	9.3724992	10.6275008	44
17	9.3612870	9.9882225	9.3730645	10.6269355	43
18	9.3618217	9.9881927	9.3736291	10.6263709	42
19	9.3623558	9.9881628	9.3741930	10.6258070	41
20	9.3628892	9.9881329	9.3747563	10.6252437	40
21	9.3634219	9.9881029	9.3753190	10.6246810	39
22	9.3639539	9.9880729	9.3758810	10.6241190	38
23	9.3644852	9.9880429	9.3764423	10.6235577	37
24	9.3650158	9.9880128	9.3770030	10.6229970	36
25	9.3655458	9.9879827	9.3775631	10.6224369	35
26	9.3660750	9.9879525	9.3781225	10.6218775	34
27	9.3666036	9.9879223	9.3786813	10.6213187	33
28	9.3671315	9.9878921	9.3792394	10.6207606	32
29	9.3676587	9.9878618	9.3797969	10.6202031	31
30	9.3681853	9.9878315	9.3803537	10.6196463	30
	Sine Complement.	Sine	Tangent Complement.	Tang.	Minut.
76 Degrees.					

13 Degrees.

Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	
30	9.3681853	9.9878315	9.3803537	10.6196403	30
31	9.3687111	9.9878012	9.3809100	10.6190900	29
32	9.3692363	9.9877708	9.3814655	10.6185345	28
33	9.3697608	9.9877404	9.3820205	10.6179795	27
34	9.3702847	9.9877099	9.3825748	10.6174252	26
35	9.3708079	9.9876794	9.3831285	10.6168715	25
36	9.3713304	9.9876488	9.3836816	10.6163184	24
37	9.3718523	9.9876183	9.3842340	10.6157660	23
38	9.3723735	9.9875876	9.3847858	10.6152142	22
39	9.3728940	9.9875570	9.3853370	10.6146630	21
40	9.3734139	9.9875263	9.3858876	10.6141124	20
41	9.3739331	9.9874955	9.3864376	10.6135624	19
42	9.3744517	9.9874648	9.3869869	10.6130131	18
43	9.3749696	9.9874339	9.3875356	10.6124664	17
44	9.3754868	9.9874031	9.3880837	10.6119163	16
45	9.3760034	9.9873722	9.3886312	10.6113688	15
46	9.3765194	9.9873413	9.3891781	10.6108219	14
47	9.3770347	9.9873103	9.3897244	10.6102756	13
48	9.3775493	9.9872793	9.3902700	10.6097300	12
49	9.3780633	9.9872482	9.3908151	10.6091849	11
50	9.3785767	9.9872171	9.3913595	10.6086405	10
51	9.3790894	9.9871860	9.3919034	10.6080966	9
52	9.3796015	9.9871549	9.3924466	10.6075534	8
53	9.3801129	9.9871236	9.3929893	10.6070107	7
54	9.3806237	9.9870924	9.3935313	10.6064687	6
55	9.3811339	9.9870611	9.3940727	10.6059272	5
56	9.3816434	9.9870298	9.3946136	10.6053864	4
57	9.3821523	9.9869984	9.3951538	10.6048462	3
58	9.3826605	9.9869670	9.3956935	10.6043065	2
59	9.3831682	9.9869356	9.3962326	10.6037674	1
60	9.3836752	9.9869041	9.3967711	10.6032289	0
	Sine Complement.	Sine	Tangent Complement.	Tang.	Minut.

76 Degrees.

14 Degrees.				
Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.
0	9.3836752	9.9869041	9.3967711	10.6032289
1	9.3841815	9.9868726	9.3973089	10.6026911
2	9.3846873	9.9868410	9.3978463	10.6021537
3	9.3851924	9.9868094	9.3983830	10.6016170
4	9.3856969	9.9867778	9.3989191	10.6010809
5	9.3862008	9.9867461	9.3994547	10.6005453
6	9.3867040	9.9867144	9.3999896	10.6000104
7	9.3872067	9.9866827	9.4005240	10.5994760
8	9.3877087	9.9866509	9.4010578	10.5989422
9	9.3882101	9.9866191	9.4015910	10.5984090
10	9.3887109	9.9865872	9.4021237	10.5978763
11	9.3892111	9.9865553	9.4026558	10.5973442
12	9.3897106	9.9865233	9.4031873	10.5968127
13	9.3902096	9.9864913	9.4037182	10.5962818
14	9.3907079	9.9864593	9.4042486	10.5957514
15	9.3912057	9.9864273	9.4047784	10.5952216
16	9.3917028	9.9863952	9.4053076	10.5946924
17	9.3921993	9.9863630	9.4058363	10.5941637
18	9.3926952	9.9863308	9.4063644	10.5936356
19	9.3931905	9.9862986	9.4068919	10.5931081
20	9.3936852	9.9862663	9.4074189	10.5925811
21	9.3941794	9.9862340	9.4079453	10.5920547
22	9.3946729	9.9862017	9.4084712	10.5915288
23	9.3951658	9.9861693	9.4089965	10.5910035
24	9.3956581	9.9861369	9.4095212	10.5904788
25	9.3961499	9.9861045	9.4100454	10.5899546
26	9.3966410	9.9860720	9.4105690	10.5894310
27	9.3971315	9.9860394	9.4110921	10.5889079
28	9.3976215	9.9860069	9.4116146	10.5883854
29	9.3981109	9.9859742	9.4121366	10.5878634
30	9.3985996	9.9859416	9.4126581	10.5873419
	Sine Complement.	Sine	Tang. Complement.	Tang.
75 Degrees.				

Minut.

14 Degrees.

Minu.	Sine	Sine Complement.	Tang.	Tangent Complement.	
30	9.3985996	9.9859416	9.4126581	10.5873419	30
31	9.3990878	9.9859089	9.4131789	10.5868211	29
32	9.3995754	9.9858762	9.4136993	10.5863007	28
33	9.4000625	9.9858434	9.4142191	10.5857809	27
34	9.4005489	9.9858106	9.4147383	10.5852617	26
35	9.4010348	9.9857777	9.4152570	10.5847430	25
36	9.4015201	9.9857449	9.4157752	10.5842248	24
37	9.4020048	9.9857119	9.4162928	10.5837072	23
38	9.4024889	9.9856790	9.4168099	10.5831901	22
39	9.4029734	9.9856460	9.4173265	10.5826735	21
40	9.4034554	9.9856129	9.4178425	10.5821575	20
41	9.4039378	9.9855798	9.4183580	10.5816420	19
42	9.4044196	9.9855467	9.4188729	10.5811271	18
43	9.4049009	9.9855135	9.4193874	10.5806126	17
44	9.4053816	9.9854803	9.4199013	10.5800987	16
45	9.4058617	9.9854471	9.4204146	10.5795854	15
46	9.4063413	9.9854138	9.4209275	10.5790725	14
47	9.4068203	9.9853805	9.4214398	10.5785602	13
48	9.4072987	9.9853471	9.4219515	10.5780485	12
49	9.4077766	9.9853138	9.4224628	10.5775372	11
50	9.4082539	9.9852803	9.4229735	10.5770265	10
51	9.4087306	9.9852468	9.4234838	10.5765162	9
52	9.4092068	9.9852133	9.4239935	10.5760065	8
53	9.4096824	9.9851798	9.4245026	10.5754974	7
54	9.4101575	9.9851462	9.4250113	10.5749887	6
55	9.4106320	9.9851125	9.4255194	10.5744806	5
56	9.4111059	9.9850789	9.4260271	10.5739729	4
57	9.4115793	9.9850452	9.4265342	10.5734658	3
58	9.4120522	9.9850114	9.4270408	10.5729592	2
59	9.4125245	9.9849776	9.4275469	10.5724531	1
60	9.4129962	9.9849438	9.4280525	10.5719475	0
	Sine Complement.	Sine	Tangent Complement	Tang.	Minut.

75 Degrees.

15 Degrees.					
Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	
0	9.4129962	9.9849438	9.4280525	10.5719475	30
1	9.4134674	9.9849099	9.4285575	10.5714425	29
2	9.4139381	9.9848760	9.4290621	10.5709379	28
3	9.4144082	9.9848420	9.4295661	10.5704339	27
4	9.4148778	9.9848081	9.4300697	10.5699303	26
5	9.4153468	9.9847740	9.4305727	10.5694273	25
6	9.4158152	9.9847400	9.4310753	10.5689247	24
7	9.4162832	9.9847059	9.4315773	10.5684227	23
8	9.4167506	9.9846717	9.4320789	10.5679211	22
9	9.4172174	9.9846375	9.4325799	10.5674201	21
10	9.4176837	9.9846033	9.4330804	10.5669196	20
11	9.4181495	9.9845690	9.4335805	10.5664195	19
12	9.4186148	9.9845347	9.4340800	10.5659200	18
13	9.4190795	9.9845004	9.4345791	10.5654209	17
14	9.4195436	9.9844660	9.4350776	10.5649224	16
15	9.4200073	9.9844316	9.4355757	10.5644243	15
16	9.4204704	9.9843971	9.4360733	10.5639267	14
17	9.4209330	9.9843626	9.4365704	10.5634296	13
18	9.4213950	9.9843281	9.4370670	10.5629330	12
19	9.4218566	9.9842935	9.4375631	10.5624369	11
20	9.4223176	9.9842589	9.4380587	10.5619413	10
21	9.4227780	9.9842242	9.4385538	10.5614462	9
22	9.4232380	9.9841895	9.4390485	10.5609515	8
23	9.4236974	9.9841548	9.4395426	10.5604574	7
24	9.4241563	9.9841200	9.4400363	10.5599637	6
25	9.4246147	9.9840852	9.4405295	10.5594705	5
26	9.4250726	9.9840503	9.4410222	10.5589778	4
27	9.4255299	9.9840154	9.4415145	10.5584855	3
28	9.4259867	9.9839805	9.4420062	10.5579938	2
29	9.4264430	9.9839455	9.4424975	10.5575025	1
30	9.4268988	9.9839105	9.4429883	10.5570117	0
	Sine Complement.	Sine	Tangent Complement.	Tang.	Minut.
74 Degrees.					

15 Degrees.

	Sine	Sine Complement.	Tang.	Tangent Complement.	
30	9.4268988	9.9839105	9.4429883	10.5570117	30
31	9.4273541	9.9838755	9.4434786	10.5565214	29
32	9.4278089	9.9838404	9.4439689	10.5560315	28
33	9.4282631	9.9838052	9.4444579	10.5555421	27
34	9.4287169	9.9837701	9.4449468	10.5550532	26
35	9.4291701	9.9837348	9.4454352	10.5545648	25
36	9.4296228	9.9836996	9.4459232	10.5540768	24
37	9.4300750	9.9836643	9.4464107	10.5535893	23
38	9.4305267	9.9836290	9.4468978	10.5531012	22
39	9.4309779	9.9835936	9.4473843	10.5526157	21
40	9.4314286	9.9835582	9.4478704	10.5521296	20
41	9.4318788	9.9835227	9.4483561	10.5516439	19
42	9.4323285	9.9834872	9.4488413	10.5511587	18
43	9.4327777	9.9834517	9.4493260	10.5506740	17
44	9.4332264	9.9834161	9.4498102	10.5501898	16
45	9.4336746	9.9833805	9.4502940	10.5497060	15
46	9.4341223	9.9833449	9.4507774	10.5492226	14
47	9.4345694	9.9833092	9.4512602	10.5487398	13
48	9.4350161	9.9832735	9.4517427	10.5482573	12
49	9.4354623	9.9832377	9.4522246	10.5477754	11
50	9.4359080	9.9832019	9.4527061	10.5472939	10
51	9.4363532	9.9831661	9.4531872	10.5468128	9
52	9.4367980	9.9831302	9.4536678	10.5463322	8
53	9.4372422	9.9830942	9.4541479	10.5458521	7
54	9.4376859	9.9830583	9.4546276	10.5453724	6
55	9.4381292	9.9830223	9.4551069	10.5448931	5
56	9.4385719	9.9829862	9.4555857	10.5444143	4
57	9.4390142	9.9829501	9.4560641	10.5439359	3
58	9.4394560	9.9829140	9.4565420	10.5434580	2
59	9.4398973	9.9828778	9.4570194	10.5429806	1
60	9.4403381	9.9828416	9.4574964	10.5425036	0

Sine Complement.

Sine

Tangent Complement.

Tang.

Minute.

74 Degrees.

C

16 Degrees.				
Minut.	Sine	Sine Complement	Tang.	Tangent Complement
0	9.4403381	9.9828416	9.4574964	10.5455036
1	9.4407784	9.9828054	9.4579730	10.5420270
2	9.4412182	9.9827691	9.4584491	10.5415509
3	9.4416576	9.9827328	9.4589248	10.5410752
4	9.4420965	9.9826964	9.4594001	10.5405999
5	9.4425349	9.9826600	9.4598749	10.5401251
6	9.4429728	9.9826236	9.4603492	10.5396508
7	9.4434103	9.9825871	9.4608232	10.5391768
8	9.4438472	9.9825506	9.4612967	10.5387033
9	9.4442837	9.9825140	9.4617697	10.5382303
10	9.4447197	9.9824774	9.4622423	10.5377577
11	9.4451553	9.9824408	9.4627145	10.5372855
12	9.4455904	9.9824041	9.4631863	10.5368137
13	9.4460250	9.9823674	9.4636576	10.5363424
14	9.4464591	9.9823306	9.4641285	10.5358715
15	9.4468927	9.9822938	9.4645990	10.5354010
16	9.4473259	9.9822569	9.4650690	10.5349310
17	9.4477586	9.9822201	9.4655386	10.5344614
18	9.4481909	9.9821831	9.4660078	10.5339922
19	9.4486227	9.9821462	9.4664765	10.5335235
20	9.4490540	9.9821092	9.4669448	10.5330552
21	9.4494849	9.9820721	9.4674127	10.5325873
22	9.4499153	9.9820351	9.4678802	10.5321198
23	9.4503452	9.9819979	9.4683473	10.5316527
24	9.4507747	9.9819608	9.4688139	10.5311861
25	9.4512037	9.9819236	9.4692801	10.5307199
26	9.4516322	9.9818863	9.4697459	10.5302541
27	9.4520603	9.9818490	9.4702112	10.5297888
28	9.4524879	9.9818117	9.4706761	10.5293238
29	9.4529151	9.9817744	9.4711407	10.5288593
30	9.4533418	9.9817370	9.4716048	10.5283951
Sine Complement	Sine		Tangent Complement	Tang.
73 Degrees.				
Minut.				

16 Degrees.

Minute	Sine	Sine Complement	Tang.	Tangens Complement	Minute
30	9.4533418	9.9817370	9.4716048	10.5283952	30
31	9.4537681	9.9816995	9.4720685	10.5279315	29
32	9.4541939	9.9816620	9.4725318	10.5274682	28
33	9.4546192	9.9816245	9.4729947	10.5270053	27
34	9.4550441	9.9815870	9.4734571	10.5265428	26
35	9.4554686	9.9815494	9.4739192	10.5260802	25
36	9.4558926	9.9815117	9.4743808	10.5256192	24
37	9.4563161	9.9814740	9.4748421	10.5251579	23
38	9.4567392	9.9814363	9.4753029	10.5246971	22
39	9.4571618	9.9813986	9.4757633	10.5242367	21
40	9.4575840	9.9813608	9.4762233	10.5237767	20
41	9.4580058	9.9813229	9.4766829	10.5233171	19
42	9.4584271	9.9812850	9.4771421	10.5228579	18
43	9.4588480	9.9812471	9.4776009	10.5223991	17
44	9.4592684	9.9812091	9.4780592	10.5219408	16
45	9.4596884	9.9811711	9.4785172	10.5214828	15
46	9.4601079	9.9811331	9.4789748	10.5210252	14
47	9.4605270	9.9810950	9.4794319	10.5205681	13
48	9.4609456	9.9810569	9.4798887	10.5201115	12
49	9.4613638	9.9810187	9.4803451	10.5196549	11
50	9.4617816	9.9809807	9.4808011	10.5191989	10
51	9.4621989	9.9809423	9.4812566	10.5187434	9
52	9.4626158	9.9809040	9.4817118	10.5182882	8
53	9.4630323	9.9808657	9.4821666	10.5178334	7
54	9.4634483	9.9808273	9.4826210	10.5173790	6
55	9.4638639	9.9807889	9.4830750	10.5169250	5
56	9.4642790	9.9807505	9.4835286	10.5164714	4
57	9.4646938	9.9807120	9.4839818	10.5160182	3
58	9.4651081	9.9806735	9.4844346	10.5155654	2
59	9.4655219	9.9806349	9.4848870	10.5151130	1
60	9.4659353	9.9805963	9.4853390	10.5146610	0
Sine Complement	Sine	Tangent Complement	Tang.	Minute	

73 Degrees.

17 Degrees.				
Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.
0	9.4659353	9.9805963	9.4853390	10.5146610
1	9.4663483	9.9805577	9.4857907	10.5142093
2	9.4667609	9.9805190	9.4862419	10.5137581
3	9.4671730	9.9804803	9.4866928	10.5133072
4	9.4675848	9.9804415	9.4871433	10.5128567
5	9.4679960	9.9804027	9.4875933	10.5124067
6	9.4684069	9.9803639	9.4880430	10.5119570
7	9.4688173	9.9803250	9.4884924	10.5115076
8	9.4692273	9.9802860	9.4889413	10.5110587
9	9.4696369	9.9802471	9.4893898	10.5106102
10	9.4700461	9.9802081	9.4898380	10.5101620
11	9.4704548	9.9801690	9.4902858	10.5097142
12	9.4708631	9.9801299	9.4907332	10.5092668
13	9.4712710	9.9800908	9.4911802	10.5088198
14	9.4716785	9.9800516	9.4916269	10.5083731
15	9.4720856	9.9800124	9.4920731	10.5079269
16	9.4724922	9.9799732	9.4925190	10.5074810
17	9.4728985	9.9799339	9.4929646	10.5070354
18	9.4733043	9.9798946	9.4934097	10.5065903
19	9.4737097	9.9798552	9.4938545	10.5061455
20	9.4741146	9.9798158	9.4942988	10.5057012
21	9.4745192	9.9797764	9.4947429	10.5052571
22	9.4749234	9.9797369	9.4951865	10.5048135
23	9.4753271	9.9796973	9.4956298	10.5043702
24	9.4757304	9.9796578	9.4960727	10.5039273
25	9.4761334	9.9796182	9.4965152	10.5034848
26	9.4765359	9.9795785	9.4969574	10.5030426
27	9.4769380	9.9795388	9.4973991	10.5026009
28	9.4773396	9.9794991	9.4978406	10.5021594
29	9.4777409	9.9794593	9.4982816	10.5017184
30	9.4781418	9.9794195	9.4987223	10.5012777
	Sine Complement.	Sine	Tangent Complement.	Tang.
				Minut.

17 Degrees.

Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	
30	9.4781418	9.9794195	9.4987223	10.5012777	30
31	9.4785423	9.9793796	9.4991626	10.5008374	29
32	9.4789423	9.9793398	9.4996026	10.5003974	28
33	9.4793420	9.9792998	9.5000422	10.4999578	27
34	9.4797412	9.9792599	9.5004814	10.4995186	26
35	9.4801401	9.9792198	9.5009203	10.4990797	25
36	9.4805385	9.9791798	9.5013588	10.4986412	24
37	9.4809366	9.9791397	9.5017969	10.4982031	23
38	9.4813342	9.9790996	9.5022347	10.4977653	22
39	9.4817315	9.9790594	9.5026721	10.4973279	21
40	9.4821283	9.9790192	9.5031092	10.4968908	20
41	9.4825248	9.9789789	9.5035459	10.4964541	19
42	9.4829208	9.9789386	9.5039822	10.4960178	18
43	9.4833165	9.9788983	9.5044182	10.4955818	17
44	9.4837117	9.9788579	9.5048538	10.4951462	16
45	9.4841066	9.9788175	9.5052891	10.4947109	15
46	9.4845010	9.9787770	9.5057240	10.4942760	14
47	9.4848951	9.9787365	9.5061586	10.4938414	13
48	9.4852888	9.9786960	9.5065928	10.4934072	12
49	9.4856820	9.9786554	9.5070267	10.4929733	11
50	9.4860749	9.9786148	9.5074602	10.4925398	10
51	9.4864674	9.9785741	9.5078933	10.4921067	9
52	9.4868595	9.9785334	9.5083261	10.4916739	8
53	9.4872512	9.9784927	9.5087586	10.4912414	7
54	9.4876426	9.9784519	9.5091907	10.4908093	6
55	9.4880335	9.9784111	9.5096224	10.4903776	5
56	9.4884240	9.9783702	9.5100539	10.4899461	4
57	9.4888142	9.9783293	9.5104849	10.4895151	3
58	9.4892040	9.9782883	9.5109156	10.4890844	2
59	9.4895934	9.9782474	9.5113460	10.4886540	1
60	9.4899824	9.9782063	9.5117760	10.4882240	0

Sine Complement.

Sine

Tangent Complement.

Tang.

Minut.

72 Degrees..

18 Degree.

Minut	Sine	Sine Complement.	Tang.	Tangent Complement.
0	9.4899824	9.9782062	9.5117760	10.488224060
1	9.4903710	9.9781653	9.5122057	10.487794359
2	9.4907592	9.9781241	9.5126351	10.487364958
3	9.4911471	9.9780830	9.5130641	10.486935957
4	9.4915345	9.9780418	9.5134927	10.486507356
5	9.4919216	9.9780006	9.5139210	10.486079055
6	9.4923083	9.9779593	9.5143490	10.485651054
7	9.4926946	9.9779180	9.5147766	10.485223453
8	9.4930806	9.9778766	9.5152039	10.484796152
9	9.4934661	9.9778353	9.5156309	10.484369151
10	9.4938513	9.9777938	9.5160575	10.483942550
11	9.4942361	9.9777523	9.5164838	10.483516249
12	9.4946205	9.9777108	9.5169097	10.483090348
13	9.4950046	9.9776693	9.5173353	10.482664747
14	9.4953883	9.9776277	9.5177606	10.482239446
15	9.4957716	9.9775860	9.5181855	10.481814545
16	9.4961545	9.9775444	9.5186101	10.481389944
17	9.4965370	9.9775026	9.5190344	10.480965643
18	9.4969192	9.9774609	9.5194583	10.480541742
19	9.4973010	9.9774191	9.5198819	10.480118141
20	9.4976824	9.9773772	9.5203052	10.479694840
21	9.4980635	9.9773354	9.5207282	10.479271839
22	9.4984442	9.9772934	9.5211508	10.478849238
23	9.4988245	9.9772515	9.5215730	10.478427037
24	9.4992045	9.9772095	9.5219950	10.478005036
25	9.4995840	9.9771674	9.5224166	10.477583435
26	9.4999633	9.9771253	9.5228379	10.477162134
27	9.5003421	9.9770832	9.5232589	10.476741133
28	9.5007206	9.9770410	9.5236795	10.476320532
29	9.5010987	9.9769988	9.5240999	10.475900131
30	9.5014764	9.9769566	9.5245199	10.475480130
	Sine Complement.	Sine	Tangent Complement.	Tang.

71 Degree.

Minut.

18 Degrees.

18 Degrees.					
Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	
30	9.5014764	9.9769566	9.5245199	10.4754801	30
31	9.5018538	9.9769143	9.5249395	10.4750605	29
32	9.5022308	9.9768720	9.5253589	10.4746411	28
33	9.5026075	9.9768296	9.5257779	10.4742221	27
34	9.5029838	9.9767872	9.5261966	10.4738034	26
35	9.5033597	9.9767447	9.5266150	10.4733850	25
36	9.5037353	9.9767022	9.5270331	10.4729669	24
37	9.5041105	9.9766597	9.5274508	10.4725492	23
38	9.5044853	9.9766171	9.5278682	10.4721318	22
39	9.5048598	9.9765745	9.5282853	10.4717142	21
40	9.5052339	9.9765318	9.5287021	10.4712979	20
41	9.5056077	9.9764891	9.5291186	10.4708814	19
42	9.5059811	9.9764464	9.5295347	10.4704653	18
43	9.5063542	9.9764036	9.5299505	10.4700495	17
44	9.5067268	9.9763608	9.5303661	10.4696339	16
45	9.5070992	9.9763179	9.5307813	10.4692187	15
46	9.5074712	9.9762750	9.5311961	10.4688039	14
47	9.5078428	9.9762321	9.5316107	10.4683893	13
48	9.5082141	9.9761891	9.5320250	10.4679750	12
49	9.5085850	9.9761461	9.5324389	10.4675611	11
50	9.5089556	9.9761030	9.5328526	10.4671474	10
51	9.5093258	9.9760599	9.5332659	10.4667341	9
52	9.5096956	9.9760167	9.5336789	10.4663211	8
53	9.5100651	9.9759736	9.5340916	10.4659084	7
54	9.5104343	9.9759303	9.5345040	10.4654960	6
55	9.5108031	9.9758870	9.5349161	10.4650839	5
56	9.5111716	9.9758437	9.5353278	10.4646722	4
57	9.5115397	9.9758004	9.5357393	10.4642607	3
58	9.5119074	9.9757570	9.5361505	10.4638495	2
59	9.5122749	9.9757135	9.5365613	10.4634387	1
60	9.5126419	9.9756701	9.5369719	10.4630281	0
	Sine Complement.	Sine.	Tangent Complement.	Tang.	Minut.

71 Degrees.	
-------------	--

71 Degrees.

19 Degrees.

Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	
0	9.5126419	9.9756701	9.5369718	10.4630281	60
1	9.5130086	9.9756265	9.5373821	10.4626179	59
2	9.5133750	9.9755830	9.5377920	10.4622080	58
3	9.5137410	9.9755394	9.5382017	10.4617983	57
4	9.5141067	9.9754957	9.5386110	10.4613890	56
5	9.5144721	9.9754521	9.5390200	10.4609800	55
6	9.5148371	9.9754083	9.5394287	10.4605713	54
7	9.5152017	9.9753646	9.5398371	10.4601629	53
8	9.5155660	9.9753208	9.5402453	10.4597547	52
9	9.5159300	9.9752769	9.5406531	10.4593469	51
10	9.5162936	9.9752330	9.5410606	10.4589394	50
11	9.5166569	9.9751891	9.5414678	10.4585322	49
12	9.5170198	9.9751451	9.5418747	10.4581253	48
13	9.5173824	9.9751011	9.5422813	10.4577187	47
14	9.5177447	9.9750570	9.5426877	10.4573123	46
15	9.5181066	9.9750129	9.5430937	10.4569063	45
16	9.5184682	9.9749688	9.5434994	10.4565006	44
17	9.5188295	9.9749246	9.5439048	10.4560952	43
18	9.5191904	9.9748804	9.5443100	10.4556900	42
19	9.5195510	9.9748361	9.5447148	10.4552852	41
20	9.5199112	9.9747918	9.5451193	10.4548807	40
21	9.5202711	9.9747475	9.5455236	10.4544764	39
22	9.5206307	9.9747031	9.5459276	10.4540724	38
23	9.5209899	9.9746587	9.5463312	10.4536688	37
24	9.5213488	9.9746142	9.5467346	10.4532654	36
25	9.5217074	9.9745697	9.5471377	10.4528623	35
26	9.5220656	9.9745252	9.5475405	10.4524595	34
27	9.5224235	9.9744806	9.5479430	10.4520570	33
28	9.5227811	9.9744359	9.5483452	10.4516548	32
29	9.5231383	9.9743913	9.5487471	10.4512529	31
30	9.5234953	9.9743466	9.5491487	10.4508513	30
	Sine Complement.	Sine	Tangent Complement.	Tang.	Minut.

70 Degrees.

19 Degrees.

Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	Minut.
30	9.51234953	9.9743466	9.5491487	10.4508513	30
31	9.51238518	9.9743018	9.5495500	10.4504500	29
32	9.51242081	9.9742570	9.5499511	10.4500489	28
33	9.51245640	9.9742122	9.5503519	10.4496481	27
34	9.51249196	9.9741673	9.5507523	10.4492477	26
35	9.51252749	9.9741224	9.5511525	10.4488475	25
36	9.51256298	9.9740774	9.5515524	10.4484476	24
37	9.51259844	9.9740324	9.5519521	10.4480479	23
38	9.51263387	9.9739873	9.5523514	10.4476486	22
39	9.51266927	9.9739422	9.5527504	10.4472496	21
40	9.51270463	9.9738971	9.5531492	10.4468508	20
41	9.51273997	9.9738519	9.5535477	10.4464523	19
42	9.51277526	9.9738067	9.5539459	10.4460541	18
43	9.51281053	9.9737615	9.5543438	10.4456562	17
44	9.51284577	9.9737162	9.5547415	10.4452585	16
45	9.51288097	9.9736709	9.5551388	10.4448612	15
46	9.51291614	9.9736255	9.5555359	10.4444641	14
47	9.51295128	9.9735801	9.5559327	10.4440673	13
48	9.51298638	9.9735346	9.5563292	10.4436708	12
49	9.51302146	9.9734891	9.5567255	10.4432745	11
50	9.51305650	9.9734435	9.5571214	10.4428786	10
51	9.51309151	9.9733980	9.5575171	10.4424829	9
52	9.51312649	9.9733523	9.5579125	10.4420875	8
53	9.51316143	9.9733067	9.5583077	10.4416923	7
54	9.51319635	9.9732610	9.5587025	10.4412975	6
55	9.51323123	9.9732152	9.5590971	10.4409029	5
56	9.51326608	9.9731694	9.5594914	10.4405086	4
57	9.51330090	9.9731236	9.5598854	10.4401146	3
58	9.51333569	9.9730777	9.5602792	10.4397208	2
59	9.51337044	9.9730318	9.5606727	10.4393273	1
60	9.51340517	9.9729858	9.5610659	10.4389341	0
	Sine Complement.	Sine	Tangent Complement	Tang.	

70 Degrees.

20 Degrees.				
Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.
0	9.5340517	9.9729858	9.5610659	10.4389341
1	9.5343986	9.9729398	9.5614588	10.4385412
2	9.5347452	9.9728938	9.5618515	10.4381485
3	9.5350915	9.9728477	9.5622439	10.4377561
4	9.5354375	9.9728016	9.5626360	10.4373640
5	9.5357832	9.9727554	9.5630278	10.4369722
6	9.5361286	9.9727092	9.5634194	10.4365806
7	9.5364737	9.9726629	9.5638107	10.4361893
8	9.5368184	9.9726166	9.5642018	10.4357982
9	9.5371628	9.9725703	9.5645925	10.4354075
10	9.5375069	9.9725239	9.5649831	10.4350169
11	9.5378508	9.9724775	9.5653733	10.4346267
12	9.5381943	9.9724310	9.5657633	10.4342369
13	9.5385375	9.9723845	9.5661530	10.4338476
14	9.5388804	9.9723380	9.5665424	10.4334576
15	9.5392230	9.9722914	9.5669316	10.4330684
16	9.5395653	9.9722448	9.5673205	10.4326795
17	9.5399073	9.9721981	9.5677091	10.4322909
18	9.5402489	9.9721514	9.5680975	10.4319025
19	9.5405903	9.9721047	9.5684856	10.4315144
20	9.5409314	9.9720579	9.5688735	10.4311265
21	9.5412721	9.9720110	9.5692611	10.4307389
22	9.5416126	9.9719642	9.5696488	10.4303516
23	9.5419527	9.9719172	9.5700355	10.4299645
24	9.5422926	9.9718703	9.5704223	10.4295777
25	9.5426321	9.9718233	9.5708088	10.4291912
26	9.5429713	9.9717762	9.5711951	10.4288049
27	9.5433103	9.9717291	9.5715811	10.4284189
28	9.5436489	9.9716820	9.5719669	10.4280331
29	9.5439873	9.9716348	9.5723524	10.4276476
30	9.5443253	9.9715876	9.5727377	10.4272623
	Sine Complement.	Sine	Tangent Complement.	Tang.
69 Degrees.				

Minut.

20 Degrees.

Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	
30	9.5443253	9.9715876	9.5727377	10.4272623	30
31	9.5446635	9.9715404	9.5731027	10.4268773	29
32	9.5450003	9.9714931	9.5735074	10.4264926	28
33	9.5453376	9.9714457	9.5738919	10.4261081	27
34	9.5456745	9.9713984	9.5742761	10.4257239	26
35	9.5460110	9.9713509	9.5746601	10.4253399	25
36	9.5463472	9.9713035	9.5750438	10.4249561	24
37	9.5466832	9.9712560	9.5754272	10.4245728	23
38	9.5470189	9.9712084	9.5758104	10.4241896	22
39	9.5473542	9.9711608	9.5761934	10.4238068	21
40	9.5476893	9.9711132	9.5765761	10.4234239	20
41	9.5480240	9.9710655	9.5769585	10.4230415	19
42	9.5483585	9.9710178	9.5773407	10.4226593	18
43	9.5486927	9.9709701	9.5777226	10.4222774	17
44	9.5490266	9.9709223	9.5781043	10.4218957	16
45	9.5493602	9.9708744	9.5784858	10.4215142	15
46	9.5496935	9.9708265	9.5788669	10.4211331	14
47	9.5500265	9.9707786	9.5792479	10.4207521	13
48	9.5503592	9.9707306	9.5796286	10.4203714	12
49	9.5506916	9.9706826	9.5800090	10.4199910	11
50	9.5510237	9.9706346	9.5803892	10.4196108	10
51	9.5513556	9.9705865	9.5807691	10.4192309	9
52	9.5516871	9.9705383	9.5811488	10.4188512	8
53	9.5520184	9.9704902	9.5815282	10.4184718	7
54	9.5523494	9.9704419	9.5819074	10.4180926	6
55	9.5526801	9.9703937	9.5822864	10.4177136	5
56	9.5530105	9.9703454	9.5826651	10.4173349	4
57	9.5533406	9.9702970	9.5830435	10.4169565	3
58	9.5536704	9.9702486	9.5834217	10.4165783	2
59	9.5539999	9.9702002	9.5837997	10.4162003	1
60	9.5543292	9.9701517	9.5841774	10.4158226	0
	Sine Complement.	Sine	Tangent Complement.	Tang.	Minut.

69 Degrees.

Minut.	21 Degrees.				Minut.
	Sine	Sine Complement.	Tang.	Tangent Complement.	
0	9.5543292	9.9701517	9.5841774	10.4158226	69
1	9.5546581	9.9701032	9.5845549	10.4154451	59
2	9.5549868	9.9700547	9.5849321	10.4150679	58
3	9.5553152	9.9700061	9.5853091	10.4146909	57
4	9.5556433	9.9699574	9.5856859	10.4143141	56
5	9.5559711	9.9699087	9.5860624	10.4139376	55
6	9.5562987	9.9698600	9.5864386	10.4135614	54
7	9.5566259	9.9698112	9.5868147	10.4131853	53
8	9.5569529	9.9697624	9.5871904	10.4128096	52
9	9.5572796	9.9697136	9.5875660	10.4124340	51
10	9.5576060	9.9696647	9.5879413	10.4120587	50
11	9.5579321	9.9696158	9.5883163	10.4116837	49
12	9.5582579	9.9695668	9.5886912	10.4113088	48
13	9.5585835	9.9695177	9.5890657	10.4109343	47
14	9.5589088	9.9694687	9.5894401	10.4105599	46
15	9.5592338	9.9694196	9.5898142	10.4101858	45
16	9.5595585	9.9693704	9.5901881	10.4098119	44
17	9.5598829	9.9693212	9.5905617	10.4094383	43
18	9.5602071	9.9692720	9.5909351	10.4090649	42
19	9.5605310	9.9692227	9.5913082	10.4086918	41
20	9.5608546	9.9691734	9.5916812	10.4083188	40
21	9.5611779	9.9691240	9.5920539	10.4079461	39
22	9.5615010	9.9690746	9.5924263	10.4075737	38
23	9.5618237	9.9690252	9.5927985	10.4072015	37
24	9.5621462	9.9689757	9.5931705	10.4068295	36
25	9.5624685	9.9689262	9.5935422	10.4064577	35
26	9.5627904	9.9688766	9.5939138	10.4060862	34
27	9.5631121	9.9688270	9.5942851	10.4057149	33
28	9.5634335	9.9687773	9.5946561	10.4053439	32
29	9.5637546	9.9687276	9.5950269	10.4049731	31
30	9.5640754	9.9686779	9.5953975	10.4046025	30
	Sine Complement.	Sine	Tangent Complement.	Tang.	Minut.
68 Degrees.					

21 Degrees.

Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	Minut.
30	9.5640754	9.9686779	9.5953975	10.4046025	30
31	9.5643960	9.9686281	9.5957679	10.4042321	29
32	9.5647163	9.9685783	9.5961380	10.4038620	28
33	9.5650363	9.9685284	9.5965079	10.4034921	27
34	9.5653561	9.9684785	9.5968776	10.4031224	26
35	9.5656756	9.9684286	9.5972470	10.4027530	25
36	9.5659948	9.9683786	9.5976162	10.4023838	24
37	9.5663137	9.9683285	9.5979852	10.4020148	23
38	9.5666324	9.9682784	9.5983540	10.4016460	22
39	9.5669508	9.9682283	9.5987225	10.4012775	21
40	9.5672689	9.9681781	9.5990908	10.4009092	20
41	9.5675868	9.9681279	9.5994588	10.4005411	19
42	9.5679044	9.9680777	9.5998267	10.4001733	18
43	9.5682217	9.9680274	9.6001943	10.3998057	17
44	9.5685387	9.9679771	9.6005617	10.3994383	16
45	9.5688555	9.9679267	9.6009289	10.3990711	15
46	9.5691721	9.9678763	9.6012958	10.3987042	14
47	9.5694883	9.9678258	9.6016625	10.3983375	13
48	9.5698043	9.9677753	9.6020290	10.3979710	12
49	9.5701200	9.9677247	9.6023953	10.3976047	11
50	9.5704355	9.9676741	9.6027613	10.3972387	10
51	9.5707506	9.9676235	9.6031271	10.3968729	9
52	9.5710656	9.9675728	9.6034927	10.3965073	8
53	9.5713802	9.9675221	9.6038581	10.3961419	7
54	9.5716946	9.9674713	9.6042233	10.3957767	6
55	9.5720087	9.9674205	9.6045882	10.3954118	5
56	9.5723226	9.9673697	9.6049529	10.3950471	4
57	9.5726362	9.9673188	9.6053174	10.3946826	3
58	9.5729495	9.9672679	9.6056817	10.3943183	2
59	9.5732626	9.9672169	9.6060457	10.3939543	1
60	9.5735754	9.9671655	9.6064096	10.3935904	0
	Sine Complement.	Sine.	Tangent Complement.	Tang.	Minut.

68 Degrees.

22 Degrees.

Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	Minut.
0	9.5735734	9.9671659	9.6064066	10.3925904	60
1	9.5738880	9.9671148	9.6067773	10.392268	59
2	9.5742003	9.9670637	9.6071366	10.3928634	58
3	9.5745123	9.9670125	9.6074997	10.3925003	57
4	9.5748240	9.9669614	9.6078627	10.3921373	56
5	9.5751356	9.9669101	9.6082254	10.3917746	55
6	9.5754468	9.9668588	9.6085880	10.3914120	54
7	9.5757578	9.9668075	9.6089503	10.3910497	53
8	9.5760685	9.9667562	9.6093124	10.3906876	52
9	9.5763790	9.9667048	9.6096742	10.3903258	51
10	9.5766892	9.9666533	9.6100359	10.3899641	50
11	9.5769991	9.9666018	9.6103973	10.3896027	49
12	9.5773088	9.9665503	9.6107586	10.3892414	48
13	9.5776183	9.9664986	9.6111196	10.3888804	47
14	9.5779275	9.9664471	9.6114804	10.3885196	46
15	9.5782364	9.9663954	9.6118409	10.3881591	45
16	9.5785450	9.9663437	9.6122013	10.3877987	44
17	9.5788535	9.9662920	9.6125615	10.3874385	43
18	9.5791616	9.9662402	9.6129214	10.3870786	42
19	9.5794695	9.9661884	9.6132812	10.3867188	41
20	9.5797773	9.9661365	9.6136407	10.3863593	40
21	9.5800845	9.9660846	9.6140000	10.3860000	39
22	9.5803917	9.9660326	9.6143591	10.3856409	38
23	9.5806986	9.9659806	9.6147180	10.3852820	37
24	9.5810052	9.9659285	9.6150766	10.3849234	36
25	9.5813116	9.9658764	9.6154351	10.3845649	35
26	9.5816177	9.9658243	9.6157934	10.3842066	34
27	9.5819236	9.9657721	9.6161514	10.3838486	33
28	9.5822292	9.9657199	9.6165093	10.3834907	32
29	9.5825345	9.9656677	9.6168669	10.3831331	31
30	9.5828397	9.9656153	9.6172243	10.3827757	30
	Sine Complement.	Sine	Tangent Complement.	Tang.	Minut.

67 Degrees.

22 Degrees.

Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	
30	9.5828397	9.9656153	9.6172243	10.3827757	30
31	9.5831445	9.9655630	9.6175815	10.3824185	29
32	9.5834491	9.9655106	9.6179385	10.3820615	28
33	9.5837535	9.9654582	9.6182953	10.3817047	27
34	9.5840576	9.9654057	9.6186519	10.3813481	26
35	9.5843615	9.9653532	9.6190083	10.3809917	25
36	9.5846651	9.9653006	9.6193645	10.3806355	24
37	9.5849685	9.9652480	9.6197205	10.3802795	23
38	9.5852716	9.9651953	9.6200762	10.3799238	22
39	9.5855745	9.9651426	9.6204318	10.3795682	21
40	9.5858771	9.9650899	9.6207872	10.3792128	20
41	9.5861795	9.9650371	9.6211423	10.3788577	19
42	9.5864816	9.9649843	9.6214974	10.3785026	18
43	9.5867835	9.9649314	9.6218520	10.3781480	17
44	9.5870851	9.9648785	9.6222066	10.3777934	16
45	9.5873865	9.9648256	9.6225609	10.3774391	15
46	9.5876876	9.9647726	9.6229150	10.3770850	14
47	9.5879885	9.9647195	9.6232690	10.3767310	13
48	9.5882892	9.9646665	9.6236227	10.3763773	12
49	9.5885896	9.9646133	9.6239763	10.3760237	11
50	9.5888897	9.9645602	9.6243296	10.3756704	10
51	9.5891897	9.9645069	9.6246827	10.3753173	9
52	9.5894893	9.9644537	9.6250356	10.3749644	8
53	9.5897888	9.9644004	9.6253884	10.3746116	7
54	9.5900880	9.9643470	9.6257409	10.3742591	6
55	9.5903869	9.9642937	9.6260932	10.3739068	5
56	9.5906856	9.9642402	9.6264454	10.3735546	4
57	9.5909841	9.9641868	9.6267973	10.3732027	3
58	9.5912823	9.9641332	9.6271491	10.3728509	2
59	9.5915803	9.9640797	9.6275006	10.3724994	1
60	9.5918780	9.9640261	9.6278519	10.3721481	0
	Sine Complement.	Sine.	Tangent Complement.	Tang.	Minut.

67 Degrees.

23 Degrees.					
Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	
0	9.5918780	9.9640261	9.6278519	10.3721481	60
1	9.5921755	9.9639724	9.6282031	10.3717969	59
2	9.5924728	9.9639187	9.6285540	10.3714460	58
3	9.5927698	9.9638650	9.6289048	10.3710952	57
4	9.5930666	9.9638112	9.6292553	10.3707447	56
5	9.5933631	9.9637574	9.6296057	10.3703943	55
6	9.5936594	9.9637036	9.6299558	10.3700442	54
7	9.5939555	9.9636496	9.6303058	10.3696942	53
8	9.5942513	9.9635957	9.6306556	10.3693444	52
9	9.5945469	9.9635417	9.6310052	10.3689948	51
10	9.5948422	9.9634877	9.6313545	10.3686455	50
11	9.5951373	9.9634336	9.6317037	10.3682963	49
12	9.5954322	9.9633795	9.6320527	10.3679473	48
13	9.5957268	9.9633253	9.6324015	10.3675985	47
14	9.5960212	9.9632711	9.6327501	10.3672499	46
15	9.5963154	9.9632168	9.6330985	10.3669015	45
16	9.5966093	9.9631625	9.6334468	10.3665532	44
17	9.5969030	9.9631082	9.6337948	10.3662052	43
18	9.5971965	9.9630538	9.6341426	10.3658574	42
19	9.5974897	9.9629994	9.6344903	10.3655097	41
20	9.5977827	9.9629449	9.6348378	10.3651622	40
21	9.5980754	9.9628904	9.6351850	10.3648150	39
22	9.5983679	9.9628358	9.6355321	10.3644679	38
23	9.5986602	9.9627812	9.6358790	10.3641210	37
24	9.5989523	9.9627266	9.6362257	10.3637743	36
25	9.5992441	9.9626719	9.6365722	10.3634278	35
26	9.5995357	9.9626172	9.6369185	10.3630815	34
27	9.5998271	9.9625624	9.6372646	10.3627354	33
28	9.6001181	9.9625076	9.6376106	10.3623894	32
29	9.6004090	9.9624527	9.6379563	10.3620437	31
30	9.6006997	9.9623978	9.6383019	10.3616981	30
	Sine Complement.	Sine	Tangent Complement.	Tang.	Minut.
66 Degrees.					

23 Degrees.

Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	Minut.
30	9.6006997	9.9623978	9.6383019	10.3616981	30
31	9.6009901	9.9623428	9.6386473	10.3613527	29
32	9.6012803	9.9622878	9.6389925	10.3610075	28
33	9.6015703	9.9622328	9.6393375	10.3606625	27
34	9.6018600	9.9621777	9.6396823	10.3603177	26
35	9.6021495	9.9621226	9.6400269	10.3599731	25
36	9.6024388	9.9620674	9.6403714	10.3596286	24
37	9.6027278	9.9620122	9.6407156	10.3592844	23
38	9.6030166	9.9619569	9.6410597	10.3589403	22
39	9.6033052	9.9619016	9.6414036	10.3585964	21
40	9.6035936	9.9618463	9.6417473	10.3582527	20
41	9.6038817	9.9617909	9.6420908	10.3579092	19
42	9.6041696	9.9617355	9.6424342	10.3575658	18
43	9.6044573	9.9616800	9.6427773	10.3572227	17
44	9.6047448	9.9616245	9.6431203	10.3568797	16
45	9.6050320	9.9615689	9.6434631	10.3565369	15
46	9.6053190	9.9615133	9.6438057	10.3561943	14
47	9.6056057	9.9614576	9.6441481	10.3558519	13
48	9.6058923	9.9614020	9.6444903	10.3555097	12
49	9.6061786	9.9613463	9.6448324	10.3551676	11
50	9.6064647	9.9612904	9.6451743	10.3548257	10
51	9.6067506	9.9612346	9.6455160	10.3544840	9
52	9.6070362	9.9611787	9.6458575	10.3541425	8
53	9.6073216	9.9611228	9.6461988	10.3538012	7
54	9.6076068	9.9610668	9.6465400	10.3534600	6
55	9.6078918	9.9610108	9.6468810	10.3531190	5
56	9.6081765	9.9609548	9.6472217	10.3527783	4
57	9.6084611	9.9608987	9.6475624	10.3524376	3
58	9.6087454	9.9608426	9.6479028	10.3520972	2
59	9.6090294	9.9607864	9.6482431	10.3517569	1
60	9.6093133	9.9607302	9.6485831	10.3514169	0
	Sine Complement.	Sine	Tangent Complement.	Tang.	Minut.

66 Degrees.

24 Degree.

Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	Minut.
0	9.6093138	9.9607302	9.6485831	10.3514169	0
1	9.6095969	9.9606739	9.6489230	10.3510770	1
2	9.6098865	9.9606176	9.6492628	10.3507372	2
3	9.6101839	9.9605612	9.6496023	10.3503977	3
4	9.6104869	9.9605048	9.6499417	10.3500582	4
5	9.6107295	9.9604484	9.6502809	10.3497191	5
6	9.6110118	9.9603919	9.6506199	10.3493801	6
7	9.6112945	9.9603354	9.6509587	10.3490412	7
8	9.6115768	9.9602788	9.6512974	10.3487026	8
9	9.6118586	9.9602222	9.6516359	10.3483641	9
10	9.6121397	9.9601655	9.6519742	10.3480258	10
11	9.6124211	9.9601088	9.6523123	10.3476877	11
12	9.6127025	9.9600520	9.6526503	10.3473497	12
13	9.6129835	9.9599952	9.6529882	10.3470119	13
14	9.6132641	9.9599384	9.6533259	10.3466743	14
15	9.6135446	9.9598814	9.6536633	10.3463369	15
16	9.6138256	9.9598246	9.6540004	10.3459996	16
17	9.6141058	9.9597676	9.6543374	10.3456623	17
18	9.6143856	9.9597106	9.6546744	10.3453256	18
19	9.6146647	9.9596533	9.6550112	10.3449888	19
20	9.6149442	9.9595962	9.6553477	10.3446523	20
21	9.6152232	9.9595393	9.6556841	10.3443159	21
22	9.6155024	9.9594821	9.6560204	10.3439796	22
23	9.6157812	9.9594248	9.6563564	10.3436436	23
24	9.6160598	9.9593673	9.6566923	10.3433077	24
25	9.6163385	9.9593101	9.6570280	10.3429720	25
26	9.6166168	9.9592528	9.6573636	10.3426364	26
27	9.6168944	9.9591954	9.6576989	10.3423011	27
28	9.6171721	9.9591380	9.6580341	10.3419659	28
29	9.6174496	9.9590803	9.6583692	10.3416308	29
30	9.6177278	9.9590229	9.6587041	10.3412960	30
	Sine Complement.	Sine	Tangent Complement.	Tang.	

24 Degrees.

Minute	Sine	Sine Complement	Tang.	Tangent Complement	Minute
30	9.6177270	9.9590229	9.6587041	10.3412960	30
31	9.6180041	9.9589653	9.6590387	10.3409613	29
32	9.6182809	9.9589077	9.6593733	10.3406267	28
33	9.6185576	9.9588500	9.6597076	10.3402924	27
34	9.6188341	9.9587923	9.6600418	10.3399582	26
35	9.6191103	9.9587345	9.6603758	10.3396242	25
36	9.6193864	9.9586767	9.6607097	10.3392903	24
37	9.6196622	9.9586183	9.6610434	10.3389566	23
38	9.6199378	9.9585609	9.6613769	10.3386231	22
39	9.6202132	9.9585030	9.6617103	10.3382897	21
40	9.6204884	9.9584450	9.6620434	10.3379566	20
41	9.6207634	9.9583869	9.6623765	10.3376237	19
42	9.6210382	9.9583288	9.6627093	10.3372907	18
43	9.6213127	9.9582707	9.6630420	10.3369580	17
44	9.6215871	9.9582125	9.6633745	10.3366255	16
45	9.6218612	9.9581543	9.6637069	10.3362931	15
46	9.6221351	9.9580961	9.6640391	10.3359609	14
47	9.6224088	9.9580378	9.6643711	10.3356289	13
48	9.6226824	9.9579794	9.6647036	10.3352970	12
49	9.6229557	9.9579210	9.6650346	10.3349654	11
50	9.6232287	9.9578626	9.6653662	10.3346338	10
51	9.6235016	9.9578041	9.6656975	10.3343025	9
52	9.6237743	9.9577456	9.6660288	10.3339712	8
53	9.6240467	9.9576870	9.6663598	10.3336402	7
54	9.6243190	9.9576284	9.6666907	10.3333093	6
55	9.6245912	9.9575697	9.6670214	10.3329786	5
56	9.6248629	9.9575110	9.6673519	10.3326481	4
57	9.6251346	9.9574522	9.6676823	10.3323177	3
58	9.6254060	9.9573934	9.6680126	10.3319874	2
59	9.6256772	9.9573346	9.6683426	10.3316574	1
60	9.6259483	9.9572757	9.6686725	10.3313275	0
	Sine Complement	Sine	Tangent Complement	Tang.	Minute

65 Degrees.

25 Degrees.

Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	Minut.
0	9.6259483	9.9572757	9.6686725	10.3313275	60
1	9.6262191	9.9572168	9.6690023	10.3309977	59
2	9.6264897	9.9571578	9.6693319	10.3306681	58
3	9.6267601	9.9570988	9.6696613	10.3303387	57
4	9.6270303	9.9570397	9.6699906	10.3300094	56
5	9.6273003	9.9569806	9.6703197	10.3296803	55
6	9.6275701	9.9569215	9.6706486	10.3293514	54
7	9.6278397	9.9568623	9.6709774	10.3290226	53
8	9.6281090	9.9568030	9.6713060	10.3286940	52
9	9.6283782	9.9567437	9.6716345	10.3283655	51
10	9.6286472	9.9566844	9.6719628	10.3280372	50
11	9.6289160	9.9566250	9.6722910	10.3277090	49
12	9.6291845	9.9565656	9.6726190	10.3273810	48
13	9.6294529	9.9565061	9.6729468	10.3270532	47
14	9.6297211	9.9564466	9.6732745	10.3267255	46
15	9.6299890	9.9563870	9.6736020	10.3263980	45
16	9.6302568	9.9563274	9.6739294	10.3260706	44
17	9.6305243	9.9562678	9.6742566	10.3257434	43
18	9.6307917	9.9562081	9.6745836	10.3254164	42
19	9.6310589	9.9561483	9.6749105	10.3250895	41
20	9.6313258	9.9560886	9.6752372	10.3247628	40
21	9.6315926	9.9560287	9.6755638	10.3244362	39
22	9.6318591	9.9559689	9.6758902	10.3241097	38
23	9.6321255	9.9559089	9.6762165	10.3237835	37
24	9.6323916	9.9558490	9.6765426	10.3234574	36
25	9.6326576	9.9557890	9.6768686	10.3231314	35
26	9.6329233	9.9557289	9.6771944	10.3228056	34
27	9.6331889	9.9556688	9.6775201	10.3224799	33
28	9.6334542	9.9556087	9.6778456	10.3221544	32
29	9.6337194	9.9555485	9.6781709	10.3218291	31
30	9.6339844	9.9554882	9.6784961	10.3215039	30
	Sine Complement.	Sine	Tangent Complement.	Tang.	Minut.

64 Degrees.

25 Degrees.

Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	Minut.
30	9.6339844	9.9554882	9.6784961	10.3215039	30
31	9.6342491	9.9554280	9.6788211	10.3211789	29
32	9.6345137	9.9553676	9.6791460	10.3208540	28
33	9.6347780	9.9553073	9.6794708	10.3205292	27
34	9.6350422	9.9552469	9.6797953	10.3202047	26
35	9.6353062	9.9551864	9.6801198	10.3198803	25
36	9.6355699	9.9551259	9.6804440	10.3195560	24
37	9.6358335	9.9550653	9.6807682	10.3192318	23
38	9.6360969	9.9550047	9.6810921	10.3189079	22
39	9.6363601	9.9549441	9.6814160	10.3185840	21
40	9.6366231	9.9548834	9.6817396	10.3182604	20
41	9.6368859	9.9548227	9.6820632	10.3179368	19
42	9.6371484	9.9547619	9.6823865	10.3176135	18
43	9.6374108	9.9547011	9.6827098	10.3172902	17
44	9.6376731	9.9546402	9.6830328	10.3169672	16
45	9.6379351	9.9545793	9.6833557	10.3166443	15
46	9.6381969	9.9545184	9.6836785	10.3163215	14
47	9.6384585	9.9544574	9.6840011	10.3159989	13
48	9.6387199	9.9543963	9.6843236	10.3156764	12
49	9.6389812	9.9543352	9.6846459	10.3153541	11
50	9.6392422	9.9542741	9.6849681	10.3150319	10
51	9.6395030	9.9542129	9.6852901	10.3147099	9
52	9.6397637	9.9541517	9.6856120	10.3143880	8
53	9.6400241	9.9540904	9.6859338	10.3140662	7
54	9.6402844	9.9540291	9.6862553	10.3137447	6
55	9.6405445	9.9539677	9.6865768	10.3134232	5
56	9.6408044	9.9539063	9.6868981	10.3131019	4
57	9.6410640	9.9538448	9.6872192	10.3127808	3
58	9.6413235	9.9537833	9.6875402	10.3124598	2
59	9.6415828	9.9537218	9.6878611	10.3121389	1
60	9.6418420	9.9536602	9.6881818	10.3118182	0
	Sine Complement.	Sine.	Tangent Complement.	Tang.	Minut.

64 Degrees.

		26 Degree.			
Minute	Sine		Tang.		Minute
	Sine	Sine Complement.	Tang.	Tangent Complement.	
0	9.6418420	9.9536602	9.6881818	10.3118182	60
1	9.6421009	9.9535985	9.6885023	10.3114977	59
2	9.6423596	9.9535369	9.6888227	10.3111773	58
3	9.6426182	9.9534751	9.6891430	10.3108570	57
4	9.6428765	9.9534134	9.6894631	10.3105369	56
5	9.6431347	9.9533515	9.6897831	10.3102169	55
6	9.6433926	9.9532897	9.6901030	10.3098970	54
7	9.6436504	9.9532278	9.6904226	10.3095774	53
8	9.6439080	9.9531658	9.6907422	10.3092578	52
9	9.6441654	9.9531038	9.6910616	10.3089384	51
10	9.6444226	9.9530418	9.6913809	10.3086191	50
11	9.6446796	9.9529797	9.6917000	10.3083000	49
12	9.6449365	9.9529175	9.6920189	10.3079811	48
13	9.6451931	9.9528553	9.6923378	10.3076622	47
14	9.6454496	9.9527931	9.6926565	10.3073435	46
15	9.6457058	9.9527308	9.6929750	10.3070250	45
16	9.6459619	9.9526685	9.6932934	10.3067066	44
17	9.6462178	9.9526061	9.6936117	10.3063883	43
18	9.6464735	9.9525437	9.6939298	10.3060702	42
19	9.6467290	9.9524813	9.6942478	10.3057522	41
20	9.6469844	9.9524188	9.6945656	10.3054344	40
21	9.6472395	9.9523562	9.6948833	10.3051167	39
22	9.6474945	9.9522936	9.6952009	10.3047991	38
23	9.6477492	9.9522310	9.6955183	10.3044817	37
24	9.6480038	9.9521683	9.6958355	10.3041645	36
25	9.6482582	9.9521055	9.6961527	10.3038473	35
26	9.6485124	9.9520428	9.6964697	10.3035303	34
27	9.6487665	9.9519799	9.6967865	10.3032135	33
28	9.6490203	9.9519172	9.6971032	10.3028968	32
29	9.6492740	9.9518541	9.6974198	10.3025802	31
30	9.6495274	9.9517912	9.6977363	10.3022637	30
Sine Complement.		Sine	Tangent Complement.	Tang.	Minute
63 Degrees.					

26 Degrees.

Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	Minut.
30	9.6495274	9.9517912	9.6977363	10.3022637	30
31	9.6497807	9.9517282	9.6980526	10.3019474	29
32	9.6500338	9.9516651	9.6983687	10.3016313	28
33	9.6502868	9.9516020	9.6986847	10.3013153	27
34	9.6505395	9.9515389	9.6990006	10.3009994	26
35	9.6507920	9.9514757	9.6993164	10.3006836	25
36	9.6510444	9.9514124	9.6996320	10.3003680	24
37	9.6512966	9.9513492	9.6999474	10.3000526	23
38	9.6515486	9.9512858	9.7002628	10.2997372	22
39	9.6518004	9.9512224	9.7005780	10.2994220	21
40	9.6520521	9.9511590	9.7008930	10.2991070	20
41	9.6523035	9.9510956	9.7012080	10.2987920	19
42	9.6525548	9.9510320	9.7015227	10.2984773	18
43	9.6528059	9.9509685	9.7018374	10.2981626	17
44	9.6530568	9.9509049	9.7021519	10.2978481	16
45	9.6533075	9.9508412	9.7024663	10.2975337	15
46	9.6535581	9.9507775	9.7027805	10.2972195	14
47	9.6538084	9.9507138	9.7030946	10.2969054	13
48	9.6540586	9.9506500	9.7034086	10.2965914	12
49	9.6543086	9.9505861	9.7037225	10.2962775	11
50	9.6545584	9.9505223	9.7040362	10.2959638	10
51	9.6548081	9.9504583	9.7043497	10.2956503	9
52	9.6550575	9.9503944	9.7046632	10.2953368	8
53	9.6553068	9.9503303	9.7049765	10.2950235	7
54	9.6555559	9.9502663	9.7052897	10.2947103	6
55	9.6558048	9.9502022	9.7056027	10.2943973	5
56	9.6560536	9.9501380	9.7059156	10.2940844	4
57	9.6563021	9.9500738	9.7062284	10.2937716	3
58	9.6565505	9.9500095	9.7065410	10.2934590	2
59	9.6567987	9.9499452	9.7068535	10.2931465	1
60	9.6570468	9.9498809	9.7071659	10.2928341	0
	Sine Complement.	Sine.	Tangent Complement.	Tang.	Minut.

63 Degrees.

27 Degree.					
Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	
0	9.6570468	9.9498809	9.7071659	10.2928341	60
1	9.6572946	9.9498165	9.7074781	10.2925219	59
2	9.6575423	9.9497521	9.7077902	10.2922098	58
3	9.6577898	9.9496876	9.7081022	10.2918978	57
4	9.6580371	9.9496230	9.7084141	10.2915859	56
5	9.6582842	9.9495585	9.7087258	10.2912742	55
6	9.6585312	9.9494938	9.7090374	10.2909626	54
7	9.6587780	9.9494292	9.7093488	10.2906512	53
8	9.6590246	9.9493645	9.7096601	10.2903399	52
9	9.6592710	9.9492997	9.7099713	10.2900287	51
10	9.6595173	9.9492349	9.7102824	10.2897176	50
11	9.6597634	9.9491700	9.7105933	10.2894067	49
12	9.6600093	9.9491051	9.7109041	10.2890959	48
13	9.6602550	9.9490402	9.7112148	10.2887852	47
14	9.6605005	9.9489752	9.7115254	10.2884746	46
15	9.6607459	9.9489101	9.7118358	10.2881642	45
16	9.6609911	9.9488450	9.7121461	10.2878539	44
17	9.6612361	9.9487799	9.7124562	10.2875438	43
18	9.6614810	9.9487147	9.7127662	10.2872338	42
19	9.6617257	9.9486495	9.7130761	10.2869239	41
20	9.6619701	9.9485842	9.7133859	10.2866141	40
21	9.6622145	9.9485189	9.7136956	10.2863044	39
22	9.6624586	9.9484535	9.7140051	10.2859949	38
23	9.6627026	9.9483881	9.7143145	10.2856855	37
24	9.6629464	9.9483227	9.7146237	10.2853763	36
25	9.6631900	9.9482572	9.7149329	10.2850671	35
26	9.6634335	9.9481916	9.7152419	10.2847581	34
27	9.6636768	9.9481260	9.7155508	10.2844492	33
28	9.6639199	9.9480604	9.7158595	10.2841405	32
29	9.6641628	9.9479947	9.7161682	10.2838318	31
30	9.6644056	9.9479289	9.7164767	10.2835233	30
	Sine Complement.	Sine	Tangent Complement.	Tang.	Minut.
62 Degrees.					

27 Degrees.

Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	Minut.
30	9.6644056	9.9479289	9.7164767	10.2835233	30
31	9.6644648	9.9478631	9.7167851	10.2832149	29
32	9.6645240	9.9477973	9.7170933	10.2829067	28
33	9.6645832	9.9477314	9.7174014	10.2825986	27
34	9.6646424	9.9476655	9.7177094	10.2822906	26
35	9.6647016	9.9475995	9.7180173	10.2819827	25
36	9.6647608	9.9475335	9.7183251	10.2816749	24
37	9.6648200	9.9474674	9.7186327	10.2813637	23
38	9.6648792	9.9474013	9.7189402	10.2810598	22
39	9.6649384	9.9473352	9.7192476	10.2807524	21
40	9.6649976	9.9472689	9.7195549	10.2804451	20
41	9.6650568	9.9472027	9.7198620	10.2801380	19
42	9.6651160	9.9471364	9.7201690	10.2798310	18
43	9.6651752	9.9470700	9.7204759	10.2795241	17
44	9.6652344	9.9470036	9.7207827	10.2792173	16
45	9.6652936	9.9469372	9.7210893	10.2789107	15
46	9.6653528	9.9468707	9.7213958	10.2786042	14
47	9.6654120	9.9468042	9.7217022	10.2782978	13
48	9.6654712	9.9467376	9.7220085	10.2779915	12
49	9.6655304	9.9466710	9.7223147	10.2776853	11
50	9.6655896	9.9466043	9.7226207	10.2773793	10
51	9.6656488	9.9465376	9.7229266	10.2770734	9
52	9.6657080	9.9464708	9.7232324	10.2767676	8
53	9.6657672	9.9464040	9.7235381	10.2764619	7
54	9.6658264	9.9463371	9.7238436	10.2761564	6
55	9.6658856	9.9462702	9.7241490	10.2758510	5
56	9.6659448	9.9462032	9.7244543	10.2755457	4
57	9.6660040	9.9461362	9.7247595	10.2752405	3
58	9.6660632	9.9460692	9.7250646	10.2749354	2
59	9.6661224	9.9460021	9.7253695	10.2746305	1
60	9.6661816	9.9459349	9.7256744	10.2743256	0
	Sine Complement.	Sine	Tangent Complement.	Tang.	Minut.

62 Degrees.

28 Degrees.					
Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	
0	9.6716093	9.9459349	9.7256744	10.2743256	60
1	9.6718468	9.9458677	9.7259791	10.2740209	59
2	9.6720841	9.9458005	9.7262837	10.2737163	58
3	9.6723213	9.9457332	9.7265881	10.2734119	57
4	9.6725583	9.9456659	9.7268925	10.2731075	56
5	9.6727952	9.9455985	9.7271967	10.2728033	55
6	9.6730319	9.9455310	9.7275008	10.2724992	54
7	9.6732684	9.9454636	9.7278048	10.2721952	53
8	9.6735047	9.9453960	9.7281087	10.2718913	52
9	9.6737409	9.9453285	9.7284124	10.2715876	51
10	9.6739769	9.9452609	9.7287161	10.2712839	50
11	9.6742128	9.9451932	9.7290196	10.2709804	49
12	9.6744485	9.9451255	9.7293230	10.2706770	48
13	9.6746840	9.9450577	9.7296263	10.2703737	47
14	9.6749194	9.9449899	9.7299295	10.2700705	46
15	9.6751546	9.9449220	9.7302325	10.2697675	45
16	9.6753896	9.9448541	9.7305354	10.2694646	44
17	9.6756245	9.9447862	9.7308383	10.2691617	43
18	9.6758592	9.9447182	9.7311410	10.2688590	42
19	9.6760937	9.9446501	9.7314436	10.2685564	41
20	9.6763281	9.9445821	9.7317460	10.2682540	40
21	9.6765623	9.9445139	9.7320484	10.2679516	39
22	9.6767963	9.9444457	9.7323506	10.2676494	38
23	9.6770302	9.9443775	9.7326527	10.2673473	37
24	9.6772640	9.9443092	9.7329547	10.2670453	36
25	9.6774975	9.9442409	9.7332566	10.2667434	35
26	9.6777309	9.9441725	9.7335584	10.2664416	34
27	9.6779642	9.9441042	9.7338601	10.2661399	33
28	9.6781972	9.9440356	9.7341616	10.2658384	32
29	9.6784301	9.9439671	9.7344631	10.2655369	31
30	9.6786629	9.9438985	9.7347644	10.2652356	30
	Sine Complement.	Sine.	Tangent Complement.	Tang.	Minut.
61 Degrees.					

28 Degrees.

Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	Minut.
30	9.6786629	9.9438985	9.7347644	10.2652356	30
31	9.6788955	9.9438299	9.7350656	10.2649344	29
32	9.6791279	9.9437612	9.7353667	10.2646333	28
33	9.6793602	9.9436925	9.7356677	10.2643323	27
34	9.6795923	9.9436238	9.7359685	10.2640315	26
35	9.6798243	9.9435549	9.7362693	10.2637307	25
36	9.6800560	9.9434861	9.7365699	10.2634301	24
37	9.6802877	9.9434172	9.7368705	10.2631295	23
38	9.6805191	9.9433482	9.7371709	10.2628291	22
39	9.6807504	9.9432792	9.7374712	10.2625288	21
40	9.6809816	9.9432102	9.7377714	10.2622286	20
41	9.6812126	9.9431411	9.7380715	10.2619285	19
42	9.6814434	9.9430720	9.7383714	10.2616286	18
43	9.6816741	9.9430028	9.7386713	10.2613287	17
44	9.6819046	9.9429335	9.7389710	10.2610290	16
45	9.6821349	9.9428643	9.7392707	10.2607293	15
46	9.6823651	9.9427949	9.7395702	10.2604298	14
47	9.6825952	9.9427255	9.7398696	10.2601304	13
48	9.6828250	9.9426561	9.7401689	10.2598311	12
49	9.6830548	9.9425866	9.7404681	10.2595319	11
50	9.6832843	9.9425171	9.7407672	10.2592328	10
51	9.6835137	9.9424476	9.7410662	10.2589338	9
52	9.6837430	9.9423779	9.7413650	10.2586350	8
53	9.6839720	9.9423083	9.7416631	10.2583362	7
54	9.6842010	9.9422386	9.7419624	10.2580376	6
55	9.6844297	9.9421688	9.7422609	10.2577391	5
56	9.6846583	9.9420990	9.7425594	10.2574406	4
57	9.6848868	9.9420291	9.7428577	10.2571423	3
58	9.6851151	9.9419592	9.7431559	10.2568441	2
59	9.6853432	9.9418893	9.7434540	10.2565460	1
60	9.6855712	9.9418193	9.7437520	10.2562480	0
	Sine Complement.	Sine	Tangent Complement.	Tang.	Minut.

61 Degrees.

Minut.

29 Degrees.

	Sine	Sine Complement.	Tang.	Tangent Complement.	
0	9.6855712	9.9418193	9.7437520	10.2562480	60
1	9.6857991	9.9417492	9.7440499	10.2559501	59
2	9.6860267	9.9416791	9.7443476	10.2556524	58
3	9.6862542	9.9416090	9.7446453	10.2553547	57
4	9.6864816	9.9415388	9.7449428	10.2550572	56
5	9.6867088	9.9414685	9.7452403	10.2547597	55
6	9.6869359	9.9413982	9.7455376	10.2544624	54
7	9.6871628	9.9413279	9.7458349	10.2541651	53
8	9.6873895	9.9412575	9.7461320	10.2538680	52
9	9.6876161	9.9411871	9.7464290	10.2535710	51
10	9.6878425	9.9411166	9.7467259	10.2532741	50
11	9.6880688	9.9410461	9.7470227	10.2529773	49
12	9.6882949	9.9409755	9.7473194	10.2526806	48
13	9.6885209	9.9409048	9.7476160	10.2523840	47
14	9.6887467	9.9408342	9.7479125	10.2520875	46
15	9.6889723	9.9407634	9.7482089	10.2517911	45
16	9.6891978	9.9406927	9.7485052	10.2514948	44
17	9.6894232	9.9406219	9.7488013	10.2511987	43
18	9.6896484	9.9405510	9.7490974	10.2509026	42
19	9.6898734	9.9404801	9.7493934	10.2506066	41
20	9.6900983	9.9404091	9.7496892	10.2503108	40
21	9.6903231	9.9403381	9.7499850	10.2500150	39
22	9.6905476	9.9402670	9.7502806	10.2497194	38
23	9.6907721	9.9401959	9.7505762	10.2494238	37
24	9.6909964	9.9401248	9.7508716	10.2491284	36
25	9.6912205	9.9400535	9.7511669	10.2488331	35
26	9.6914445	9.9399823	9.7514622	10.2485378	34
27	9.6916683	9.9399110	9.7517573	10.2482427	33
28	9.6918919	9.9398396	9.7520523	10.2479477	32
29	9.6921155	9.9397682	9.7523472	10.2476528	31
30	9.6923388	9.9396968	9.7526420	10.2473580	30
	Sine Complement.	Sine	Tangent Complement.	Tangent Complement.	Minut.

60 Degrees.

29 Degrees.

Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	Minut.
30	9.6923388	9.9396968	9.7526420	10.2473580	30
31	9.6925620	9.9396253	9.7529368	10.2470632	29
32	9.6927851	9.9395537	9.7532314	10.2467686	28
33	9.6930080	9.9394821	9.7535259	10.2464741	27
34	9.6932308	9.9394105	9.7538203	10.2461797	26
35	9.6934534	9.9393388	9.7541146	10.2458854	25
36	9.6936758	9.9392671	9.7544088	10.2455912	24
37	9.6938981	9.9391953	9.7547029	10.2452971	23
38	9.6941203	9.9391234	9.7549969	10.2450031	22
39	9.6943423	9.9390515	9.7552908	10.2447092	21
40	9.6945642	9.9389796	9.7555846	10.2444154	20
41	9.6947859	9.9389076	9.7558783	10.2441217	19
42	9.6950074	9.9388356	9.7561718	10.2438282	18
43	9.6952288	9.9387635	9.7564653	10.2435347	17
44	9.6954501	9.9386914	9.7567587	10.2432413	16
45	9.6956712	9.9386192	9.7570520	10.2429480	15
46	9.6958922	9.9385470	9.7573452	10.2426548	14
47	9.6961130	9.9384747	9.7576383	10.2423617	13
48	9.6963336	9.9384024	9.7579313	10.2420687	12
49	9.6965541	9.9383300	9.7582242	10.2417758	11
50	9.6967745	9.9382576	9.7585170	10.2414830	10
51	9.6969947	9.9381851	9.7588096	10.2411904	9
52	9.6972148	9.9381126	9.7591022	10.2408978	8
53	9.6974347	9.9380400	9.7593947	10.2406053	7
54	9.6976545	9.9379674	9.7596871	10.2403129	6
55	9.6978741	9.9378947	9.7599794	10.2400206	5
56	9.6980936	9.9378220	9.7602716	10.2397284	4
57	9.6983129	9.9377492	9.7605637	10.2394363	3
58	9.6985321	9.9376764	9.7608557	10.2391443	2
59	9.6987511	9.9376035	9.7611476	10.2388524	1
60	9.6989700	9.9375306	9.7614394	10.2385606	0
	Sine Complement.	Sine	Tangent Complement	Tang.	Minut.

60 Degrees.

Minut.

30 Degrees.

Sine	Sine Complement.	Tang.	Tangent Complement.
0 9.6989700	9.9375306	9.7614394	10.2385606 60
1 9.6991887	9.9374577	9.7617311	10.2382689 59
2 9.6994073	9.9373847	9.7620227	10.2379773 58
3 9.6996258	9.9373116	9.7623142	10.2376858 57
4 9.6998441	9.9372385	9.7626056	10.2373944 56
5 9.7000622	9.9371653	9.7628969	10.2371031 55
6 9.7002802	9.9370921	9.7631881	10.2368119 54
7 9.7004981	9.9370189	9.7634792	10.2365208 53
8 9.7007158	9.9369456	9.7637702	10.2362298 52
9 9.7009334	9.9368722	9.7640612	10.2359388 51
10 9.7011508	9.9367988	9.7643520	10.2356480 50
11 9.7013681	9.9367254	9.7646427	10.2353573 49
12 9.7015852	9.9366519	9.7649334	10.2350666 48
13 9.7018022	9.9365783	9.7652239	10.2347761 47
14 9.7020190	9.9365047	9.7655143	10.2344857 46
15 9.7022357	9.9364311	9.7658047	10.2341953 45
16 9.7024523	9.9363574	9.7660949	10.2339051 44
17 9.7026687	9.9362836	9.7663851	10.2336149 43
18 9.7028849	9.9362098	9.7666751	10.2333249 42
19 9.7031011	9.9361360	9.7669651	10.2330349 41
20 9.7033170	9.9360621	9.7672550	10.2327450 40
21 9.7035329	9.9359881	9.7675448	10.2324551 39
22 9.7037486	9.9359141	9.7678344	10.2321656 38
23 9.7039641	9.9358401	9.7681240	10.2318760 37
24 9.7041795	9.9357660	9.7684135	10.2315865 36
25 9.7043947	9.9356918	9.7687029	10.2312971 35
26 9.7046099	9.9356177	9.7689922	10.2310078 34
27 9.7048248	9.9355434	9.7692814	10.2307186 33
28 9.7050397	9.9354691	9.7695705	10.2304295 32
29 9.7052543	9.9353948	9.7698596	10.2301404 31
30 9.7054689	9.9353204	9.7701485	10.2298515 30
Sine Complement.	Sine	Tangent Complement.	Tang.

39 Degrees.

Minut.

30 Degrees.

Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	Minut.
60	9.7054689	9.9353204	9.7701485	10.2298515	30
59	9.7056833	9.9352459	9.7704373	10.2295627	29
58	9.7058975	9.9351714	9.7707161	10.2292739	28
57	9.7061116	9.9350969	9.7710147	10.2289853	27
56	9.7063256	9.9350223	9.7713033	10.2286967	26
55	9.7065394	9.9349477	9.7715917	10.2284083	25
54	9.7067531	9.9348730	9.7718801	10.2281199	24
53	9.7069667	9.9347983	9.7721684	10.2278316	23
52	9.7071801	9.9347235	9.7724566	10.2275434	22
51	9.7073933	9.9346486	9.7727447	10.2272553	21
50	9.7076064	9.9345738	9.7730327	10.2269673	20
49	9.7078194	9.9344988	9.7733206	10.2266794	19
48	9.7080323	9.9344238	9.7736084	10.2263916	18
47	9.7082450	9.9343488	9.7738961	10.2261039	17
46	9.7084575	9.9342737	9.7741838	10.2258162	16
45	9.7086699	9.9341986	9.7744713	10.2255287	15
44	9.7088822	9.9341234	9.7747588	10.2252412	14
43	9.7090943	9.9340482	9.7750462	10.2249538	13
42	9.7093063	9.9339729	9.7753334	10.2246666	12
41	9.7095182	9.9338976	9.7756206	10.2243794	11
40	9.7097299	9.9338222	9.7759077	10.2240923	10
39	9.7099415	9.9337467	9.7761947	10.2238053	9
38	9.7101529	9.9336713	9.7764816	10.2235184	8
37	9.7103642	9.9335957	9.7767685	10.2232315	7
36	9.7105753	9.9335201	9.7770552	10.2229448	6
35	9.7107863	9.9334445	9.7773418	10.2226582	5
34	9.7109972	9.9333688	9.7776284	10.2223716	4
33	9.7112080	9.9332931	9.7779149	10.2220851	3
32	9.7114186	9.9332173	9.7782012	10.2217988	2
31	9.7116290	9.9331415	9.7784875	10.2215125	1
30	9.7118393	9.9330656	9.7787737	10.2212263	0
	Sine Complement.	Sine	Tangent Complement	Tang.	Minut.

59 Degrees.

31 Degrees.					
Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	
0	9.7118393	9.9330656	9.7787737	10.2212263	60
1	9.7120495	9.9329897	9.7790599	10.2209401	59
2	9.7122596	9.9329137	9.7793459	10.2206541	58
3	9.7124695	9.9328376	9.7796318	10.2203682	57
4	9.7126792	9.9327616	9.7799177	10.2200823	56
5	9.7128889	9.9326854	9.7802034	10.2197966	55
6	9.7130983	9.9326092	9.7804891	10.2195109	54
7	9.7133077	9.9325330	9.7807747	10.2192253	53
8	9.7135169	9.9324567	9.7810602	10.2189398	52
9	9.7137260	9.9323804	9.7813456	10.2186544	51
10	9.7139349	9.9323040	9.7816309	10.2183691	50
11	9.7141437	9.9322276	9.7819162	10.2180838	49
12	9.7143524	9.9321511	9.7822013	10.2177987	48
13	9.7145609	9.9320746	9.7824864	10.2175136	47
14	9.7147693	9.9319980	9.7827713	10.2172287	46
15	9.7149776	9.9319213	9.7830562	10.2169438	45
16	9.7151857	9.9318447	9.7833410	10.2166590	44
17	9.7153937	9.9317679	9.7836258	10.2163742	43
18	9.7156015	9.9316911	9.7839104	10.2160896	42
19	9.7158092	9.9316143	9.7841949	10.2158051	41
20	9.7160168	9.9315374	9.7844794	10.2155206	40
21	9.7162243	9.9314605	9.7847638	10.2152362	39
22	9.7164316	9.9313835	9.7850481	10.2149519	38
23	9.7166387	9.9313065	9.7853323	10.2146677	37
24	9.7168458	9.9312294	9.7856164	10.2143836	36
25	9.7170526	9.9311522	9.7859004	10.2140996	35
26	9.7172594	9.9310750	9.7861844	10.2138156	34
27	9.7174660	9.9309978	9.7864682	10.2135318	33
28	9.7176725	9.9309205	9.7867520	10.2132480	32
29	9.7178789	9.9308432	9.7870357	10.2129643	31
30	9.7180851	9.9307658	9.7873193	10.2126807	30
	Sine Complement.	Sine	Tangent Complement.	Tang.	Minut.
58 Degrees.					

31 Degrees.

Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	
30	9.7180851	9.9307658	9.7873193	10.2126807	30
31	9.7182912	9.9306883	9.7876028	10.2123972	29
32	9.7184971	9.9306109	9.7878863	10.2121137	28
33	9.7187030	9.9305333	9.7881696	10.2118304	27
34	9.7189086	9.9304557	9.7884529	10.2115471	26
35	9.7191142	9.9303781	9.7887361	10.2112639	25
36	9.7193196	9.9303004	9.7890192	10.2109808	24
37	9.7195249	9.9302226	9.7893023	10.2106977	23
38	9.7197300	9.9301448	9.7895852	10.2104148	22
39	9.7199350	9.9300670	9.7898681	10.2101319	21
40	9.7201399	9.9299891	9.7901508	10.2098492	20
41	9.7203447	9.9299112	9.7904335	10.2095665	19
42	9.7205493	9.9298332	9.7907161	10.2092839	18
43	9.7207538	9.9297551	9.7909987	10.2090013	17
44	9.7209581	9.9296770	9.7912811	10.2087189	16
45	9.7211623	9.9295989	9.7915635	10.2084365	15
46	9.7213664	9.9295207	9.7918458	10.2081542	14
47	9.7215704	9.9294424	9.7921280	10.2078720	13
48	9.7217742	9.9293641	9.7924101	10.2075899	12
49	9.7219779	9.9292857	9.7926921	10.2073079	11
50	9.7221814	9.9292073	9.7929741	10.2070259	10
51	9.7223848	9.9291289	9.7932560	10.2067440	9
52	9.7225881	9.9290504	9.7935378	10.2064622	8
53	9.7227913	9.9289713	9.7938195	10.2061805	7
54	9.7229943	9.9288932	9.7941011	10.2058989	6
55	9.7231972	9.9288145	9.7943827	10.2056173	5
56	9.7234000	9.9287358	9.7946641	10.2053359	4
57	9.7236026	9.9286571	9.7949455	10.2050545	3
58	9.7238051	9.9285783	9.7952268	10.2047732	2
59	9.7240075	9.9284994	9.7955081	10.2044919	1
60	9.7242097	9.9284205	9.7957892	10.2042108	0
	Sine Complement.	Sine	Tangent Complement.	Tang.	Minut.

58 Degrees.

32 Degrees.

Minut	Sine	Sine Complement	Tang.	Tangent Complement.	
0	9.7242097	9.9284205	9.7957892	10.2042108	60
1	9.7244118	9.9283415	9.7960703	10.2039297	59
2	9.7246138	9.9282625	9.7963513	10.2036487	58
3	9.7248156	9.9281834	9.7966322	10.2033678	57
4	9.7250174	9.9281043	9.7969130	10.2030870	56
5	9.7252189	9.9280251	9.7971938	10.2028062	55
6	9.7254204	9.9279459	9.7974745	10.2025255	54
7	9.7256217	9.9278666	9.7977551	10.2022449	53
8	9.7258229	9.9277873	9.7980356	10.2019644	52
9	9.7260240	9.9277079	9.7983160	10.2016840	51
10	9.7262249	9.9276285	9.7985964	10.2014036	50
11	9.7264257	9.9275490	9.7988767	10.2011233	49
12	9.7266264	9.9274695	9.7991569	10.2008431	48
13	9.7268269	9.9273899	9.7994370	10.2005630	47
14	9.7270273	9.9273103	9.7997170	10.2002830	46
15	9.7272276	9.9272306	9.7999970	10.2000030	45
16	9.7274278	9.9271509	9.8002769	10.1997231	44
17	9.7276278	9.9270711	9.8005567	10.1994433	43
18	9.7278277	9.9269913	9.8008365	10.1991635	42
19	9.7280275	9.9269114	9.8011161	10.1988839	41
20	9.7282271	9.9268314	9.8013957	10.1986043	40
21	9.7284267	9.9267514	9.8016752	10.1983248	39
22	9.7286260	9.9266714	9.8019546	10.1980454	38
23	9.7288253	9.9265913	9.8022340	10.1977660	37
24	9.7290244	9.9265112	9.8025133	10.1974867	36
25	9.7292234	9.9264310	9.8027925	10.1972075	35
26	9.7294223	9.9263507	9.8030716	10.1969284	34
27	9.7296211	9.9262704	9.8033506	10.1966494	33
28	9.7298197	9.9261901	9.8036296	10.1963704	32
29	9.7300182	9.9261096	9.8039085	10.1960915	31
30	9.7302165	9.9260292	9.8041873	10.1958127	30
	Sine Complement.	Sine	Tangent Complement.	Tang.	Minut.

57 Degrees.

32 Degrees.

Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	
30	9.7302165	9.9260292	9.8041873	10.1958127	30
31	9.7304148	9.9259487	9.8044661	10.1955339	29
32	9.7306129	9.9258681	9.8047447	10.1952553	28
33	9.7308109	9.9257875	9.8050233	10.1949767	27
34	9.7310087	9.9257069	9.8053019	10.1946981	26
35	9.7312064	9.9256261	9.8055803	10.1944197	25
36	9.7314040	9.9255454	9.8058587	10.1941413	24
37	9.7316015	9.9254646	9.8061370	10.1938630	23
38	9.7317989	9.9253837	9.8064152	10.1935848	22
39	9.7319961	9.9253028	9.8066933	10.1933067	21
40	9.7321932	9.9252218	9.8069714	10.1930286	20
41	9.7323902	9.9251408	9.8072494	10.1927506	19
42	9.7325870	9.9250597	9.8075273	10.1924727	18
43	9.7327837	9.9249786	9.8078052	10.1921948	17
44	9.7329803	9.9248974	9.8080829	10.1919171	16
45	9.7331768	9.9248161	9.8083606	10.1916394	15
46	9.7333731	9.9247349	9.8086383	10.1913617	14
47	9.7335693	9.9246535	9.8089158	10.1910842	13
48	9.7337654	9.9245721	9.8091933	10.1908067	12
49	9.7339614	9.9244907	9.8094707	10.1905293	11
50	9.7341572	9.9244092	9.8097480	10.1902520	10
51	9.7343529	9.9243277	9.8100253	10.1899747	9
52	9.7345485	9.9242461	9.8103025	10.1896975	8
53	9.7347440	9.9241644	9.8105796	10.1894204	7
54	9.7349393	9.9240827	9.8108566	10.1891434	6
55	9.7351345	9.9240010	9.8111336	10.1888664	5
56	9.7353296	9.9239191	9.8114105	10.1885895	4
57	9.7355246	9.9238373	9.8116873	10.1883127	3
58	9.7357195	9.9237554	9.8119641	10.1880359	2
59	9.7359142	9.9236734	9.8122408	10.1877592	1
60	9.7361088	9.9235914	9.8125174	10.1874826	0
	ne Complement.	Sine	Tangent Complement.	Tang.	Minut.

57 Degrees.

33 Degrees.				
Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.
0	9.7361088	9.9235914	9.8125174	10.1874826 60
1	9.7363032	9.9235093	9.8127939	10.1872061 59
2	9.7364976	9.9234272	9.8130704	10.1869296 58
3	9.7366918	9.9233450	9.8133468	10.1866532 57
4	9.7368859	9.9232628	9.8136231	10.1863769 56
5	9.7370799	9.9231805	9.8138993	10.1861007 55
6	9.7372737	9.9230982	9.8141755	10.1858245 54
7	9.7374675	9.9230158	9.8144516	10.1855484 53
8	9.7376611	9.9229334	9.8147277	10.1852723 52
9	9.7378546	9.9228509	9.8150036	10.1849964 51
10	9.7380479	9.9227684	9.8152795	10.1847205 50
11	9.7382412	9.9226858	9.8155554	10.1844446 49
12	9.7384343	9.9226032	9.8158311	10.1841689 48
13	9.7386273	9.9225205	9.8161068	10.1838932 47
14	9.7388201	9.9224377	9.8163824	10.1836176 46
15	9.7390129	9.9223549	9.8166580	10.1833420 45
16	9.7392055	9.9222721	9.8169335	10.1830665 44
17	9.7393980	9.9221891	9.8172089	10.1827911 43
18	9.7395904	9.9221062	9.8174842	10.1825158 42
19	9.7397827	9.9220232	9.8177595	10.1822405 41
20	9.7399748	9.9219401	9.8180347	10.1819653 40
21	9.7401668	9.9218570	9.8183098	10.1816902 39
22	9.7403587	9.9217738	9.8185849	10.1814151 38
23	9.7405505	9.9216906	9.8188599	10.1811401 37
24	9.7407421	9.9216073	9.8191348	10.1808652 36
25	9.7409337	9.9215240	9.8194096	10.1805904 35
26	9.7411251	9.9214406	9.8196844	10.1803156 34
27	9.7413164	9.9213572	9.8199592	10.1800408 33
28	9.7415075	9.9212737	9.8102338	10.1797662 32
29	9.7416986	9.9211902	9.8105084	10.1794916 31
30	9.7418895	9.9211066	9.8107829	10.1792171 30
	Sine Complement.	Sine	Tangent Complement.	Tang.
56 Degree.				
				Minut.

33 Degrees.

Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	
60	9.7418895	9.9211066	9.8207829	10.1792171	30
59	9.7420803	9.9210229	9.8210574	10.1789426	29
58	9.7422710	9.9209393	9.8213317	10.1786683	28
57	9.7424616	9.9208555	9.8216060	10.1783940	27
56	9.7426520	9.9207717	9.8218803	10.1781197	26
55	9.7428423	9.9206878	9.8221545	10.1778455	25
54	9.7430325	9.9206039	9.8224286	10.1775714	24
53	9.7432226	9.9205200	9.8227026	10.1772974	23
52	9.7434126	9.9204360	9.8229766	10.1770234	22
51	9.7436024	9.9203519	9.8232505	10.1767495	21
50	9.7437921	9.9202678	9.8235244	10.1764756	20
49	9.7439817	9.9201836	9.8237981	10.1762019	19
48	9.7441712	9.9200994	9.8240719	10.1759281	18
47	9.7443606	9.9200151	9.8243455	10.1756545	17
46	9.7445498	9.9199308	9.8246191	10.1753809	16
45	9.7447390	9.9198464	9.8248926	10.1751074	15
44	9.7449280	9.9197619	9.8251660	10.1748340	14
43	9.7451169	9.9196775	9.8254394	10.1745606	13
42	9.7453056	9.9195929	9.8257127	10.1742873	12
41	9.7454943	9.9195083	9.8259860	10.1740140	11
40	9.7456828	9.9194237	9.8262592	10.1737408	10
39	9.7458712	9.9193390	9.8265323	10.1734677	9
38	9.7460595	9.9192542	9.8268053	10.1731947	8
37	9.7462477	9.9191694	9.8270783	10.1729217	7
36	9.7464358	9.9190845	9.8273513	10.1726487	6
35	9.7466237	9.9189996	9.8276241	10.1723759	5
34	9.7468115	9.9189146	9.8278969	10.1721031	4
33	9.7469992	9.9188296	9.8281696	10.1718304	3
32	9.7471868	9.9187445	9.8284423	10.1715577	2
31	9.7473743	9.9186594	9.8287149	10.1712851	1
30	9.7475617	9.9185742	9.8289874	10.1710126	0
	Sine Complement.	Sine	Tangent Complement.	Tang.	Minut.

56 Degrees.

34 Degrees.					
Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	
0	9.7475617	9.9185742	9.8289874	10.1710126	60
1	9.7477489	9.9184890	9.8292599	10.1707401	59
2	9.7479360	9.9184037	9.8295323	10.1704677	58
3	9.7481230	9.9183183	9.8298047	10.1701953	57
4	9.7483099	9.9182329	9.8300769	10.1699231	56
5	9.7484967	9.9181475	9.8303492	10.1696508	55
6	9.7486833	9.9180620	9.8306213	10.1693787	54
7	9.7488698	9.9179764	9.8308934	10.1691066	53
8	9.7490562	9.9178908	9.8311654	10.1688346	52
9	9.7492425	9.9178051	9.8314374	10.1685626	51
10	9.7494287	9.9177194	9.8317093	10.1682907	50
11	9.7496148	9.9176336	9.8319811	10.1680189	49
12	9.7498007	9.9175478	9.8322529	10.1677471	48
13	9.7499866	9.9174619	9.8325246	10.1674754	47
14	9.7501723	9.9173760	9.8327963	10.1672037	46
15	9.7503579	9.9172900	9.8330679	10.1669321	45
16	9.7505434	9.9172040	9.8333394	10.1666606	44
17	9.7507287	9.9171179	9.8336109	10.1663891	43
18	9.7509140	9.9170317	9.8338823	10.1661177	42
19	9.7510991	9.9169455	9.8341536	10.1658464	41
20	9.7512842	9.9168593	9.8344249	10.1655751	40
21	9.7514691	9.9167730	9.8346961	10.1653039	39
22	9.7516538	9.9166866	9.8349673	10.1650327	38
23	9.7518385	9.9166003	9.8352384	10.1647616	37
24	9.7520231	9.9165137	9.8355094	10.1644906	36
25	9.7522075	9.9164272	9.8357804	10.1642196	35
26	9.7523919	9.9163406	9.8360513	10.1639487	34
27	9.7525761	9.9162539	9.8363221	10.1636779	33
28	9.7527602	9.9161673	9.8365929	10.1634071	32
29	9.7529442	9.9160805	9.8368636	10.1631364	31
30	9.7531280	9.9159937	9.8371343	10.1628657	30
	Sine Complement.	Sine	Tangent Complement.	Tang.	Minut.
55 Degrees.					

34 Degrees.

Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	
30	9.7531280	9.9159937	9.8371343	10.1628657	30
31	9.7533118	9.9159069	9.8374049	10.1625951	29
32	9.7534954	9.9158200	9.8376755	10.1623245	28
33	9.7536790	9.9157330	9.8379460	10.1620540	27
34	9.7538624	9.9156460	9.8382164	10.1617836	26
35	9.7540457	9.9155589	9.8384867	10.1615133	25
36	9.7542288	9.9154718	9.8387571	10.1612429	24
37	9.7544119	9.9153846	9.8390273	10.1609727	23
38	9.7545949	9.9152974	9.8392975	10.1607025	22
39	9.7547777	9.9152101	9.8395676	10.1604324	21
40	9.7549604	9.9151228	9.8398377	10.1601623	20
41	9.7551431	9.9150354	9.8401077	10.1598923	19
42	9.7553256	9.9149479	9.8403776	10.1596224	18
43	9.7555080	9.9148604	9.8406475	10.1593525	17
44	9.7556902	9.9147729	9.8409174	10.1590826	16
45	9.7558724	9.9146852	9.8411871	10.1588129	15
46	9.7560544	9.9145976	9.8414569	10.1585431	14
47	9.7562364	9.9145099	9.8417265	10.1582735	13
48	9.7564182	9.9144221	9.8419961	10.1580039	12
49	9.7565999	9.9143342	9.8422657	10.1577343	11
50	9.7567815	9.9142464	9.8425351	10.1574649	10
51	9.7569630	9.9141584	9.8428046	10.1571954	9
52	9.7571444	9.9140704	9.8430739	10.1569261	8
53	9.7573256	9.9139824	9.8433432	10.1566568	7
54	9.7575068	9.9138943	9.8436125	10.1563875	6
55	9.7576878	9.9138061	9.8438817	10.1561183	5
56	9.7578687	9.9137179	9.8441508	10.1558492	4
57	9.7580495	9.9136296	9.8444199	10.1555801	3
58	9.7582302	9.9135413	9.8446889	10.1553111	2
59	9.7584108	9.9134530	9.8449579	10.1550421	1
60	9.7585913	9.9133645	9.8452268	10.1547732	0
	Sine Complement.	Sine	Tangent Complement.	Tang.	Minut.

55 Degrees.

35 Degrees.				
Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.
0	9.7585913	9.9133645	9.8452268	10.1547732
1	9.7587717	9.9132760	9.8454956	10.1545044
2	9.7589519	9.9131875	9.8457644	10.1542356
3	9.7591321	9.9130989	9.8460332	10.1539668
4	9.7593121	9.9130102	9.8463018	10.1536982
5	9.7594920	9.9129215	9.8465705	10.1534295
6	9.7596718	9.9128328	9.8468390	10.1531610
7	9.7598515	9.9127440	9.8471075	10.1528925
8	9.7600311	9.9126551	9.8473760	10.1526240
9	9.7602106	9.9125662	9.8476444	10.1523556
10	9.7603899	9.9124772	9.8479127	10.1520873
11	9.7605692	9.9123882	9.8481810	10.1518190
12	9.7607483	9.9122991	9.8484492	10.1515508
13	9.7609274	9.9122099	9.8487174	10.1512826
14	9.7611063	9.9121207	9.8489855	10.1510145
15	9.7612851	9.9120315	9.8492536	10.1507464
16	9.7614638	9.9119422	9.8495216	10.1504784
17	9.7616424	9.9118528	9.8497896	10.1502104
18	9.7618208	9.9117634	9.8500575	10.1499425
19	9.7619992	9.9116739	9.8503253	10.1496747
20	9.7621775	9.9115844	9.8505931	10.1494069
21	9.7623556	9.9114948	9.8508608	10.1491392
22	9.7625337	9.9114051	9.8511285	10.1488715
23	9.7627116	9.9113155	9.8513961	10.1486039
24	9.7628894	9.9112257	9.8516637	10.1483363
25	9.7630671	9.9111359	9.8519312	10.1480688
26	9.7632447	9.9110460	9.8521987	10.1478013
27	9.7634222	9.9109561	9.8524661	10.1475339
28	9.7635996	9.9108661	9.8527335	10.1472665
29	9.7637769	9.9107761	9.8530008	10.1469992
30	9.7639540	9.9106860	9.8532680	10.1467320
	Sine Complement.	Sine	Tangent Complement.	Tang.
54 Degrees.				

Minut.

35 Degrees.

Minu.	Sine	Sine Complement.	Tang.	Tangent Complement.	
30	9.7639540	9.9106860	9.8532680	10.1467320	30
31	9.7641311	9.9105959	9.8535352	10.1464648	29
32	9.7643080	9.9105057	9.8538023	10.1461977	28
33	9.7644849	9.9104155	9.8540694	10.1459306	27
34	9.7646616	9.9103251	9.8543365	10.1456635	26
35	9.7648382	9.9102348	9.8546034	10.1453966	25
36	9.7650147	9.9101444	9.8548704	10.1451296	24
37	9.7651911	9.9100539	9.8551372	10.1448628	23
38	9.7653674	9.9099634	9.8554041	10.1445959	22
39	9.7655436	9.9098728	9.8556708	10.1443292	21
40	9.7657197	9.9097821	9.8559376	10.1440624	20
41	9.7658957	9.9096915	9.8562042	10.1437958	19
42	9.7660715	9.9096007	9.8564708	10.1435292	18
43	9.7662473	9.9095099	9.8567374	10.1432626	17
44	9.7664229	9.9094190	9.8570039	10.1429961	16
45	9.7665985	9.9093281	9.8572704	10.1427296	15
46	9.7667739	9.9092371	9.8575368	10.1424632	14
47	9.7669492	9.9091461	9.8578031	10.1421969	13
48	9.7671244	9.9090550	9.8580694	10.1419306	12
49	9.7672996	9.9089639	9.8583357	10.1416643	11
50	9.7674746	9.9088727	9.8586019	10.1413981	10
51	9.7676494	9.9087814	9.8588680	10.1411320	9
52	9.7678243	9.9086901	9.8591341	10.1408659	8
53	9.7679989	9.9085988	9.8594002	10.1405998	7
54	9.7681735	9.9085073	9.8596661	10.1403339	6
55	9.7683480	9.9084159	9.8599321	10.1400679	5
56	9.7685223	9.9083243	9.8601980	10.1398020	4
57	9.7686966	9.9082327	9.8604638	10.1395362	3
58	9.7688707	9.9081411	9.8607296	10.1392704	2
59	9.7690448	9.9080494	9.8609954	10.1390046	1
60	9.7692187	9.9079576	9.8612610	10.1387390	0
	Sine Complement.	Sine	Tangent Complement.	Tang.	Minut.

54 Degrees.

Minut.

36 Degrees.

Sine	Sine Complement.	Tang.	Tangent Complement.	
0 9.7692187	9.9079576	9.8612610	10.1387390	60
1 9.7693925	9.9078658	9.8615267	10.1384733	59
2 9.7695662	9.9077740	9.8617923	10.1382077	58
3 9.7697398	9.9076820	9.8620578	10.1379422	57
4 9.7699134	9.9075901	9.8623233	10.1376767	56
5 9.7700868	9.9074980	9.8625887	10.1374113	55
6 9.7702601	9.9074059	9.8628541	10.1371459	54
7 9.7704332	9.9073138	9.8631195	10.1368805	53
8 9.7706063	9.9072216	9.8633848	10.1366152	52
9 9.7707793	9.9071293	9.8636500	10.1363500	51
10 9.7709522	9.9070370	9.8639152	10.1360848	50
11 9.7711249	9.9069446	9.8641803	10.1358197	49
12 9.7712976	9.9068522	9.8644454	10.1355546	48
13 9.7714702	9.9067597	9.8647105	10.1352895	47
14 9.7716426	9.9066671	9.8649755	10.1350245	46
15 9.7718150	9.9065745	9.8652404	10.1347596	45
16 9.7719872	9.9064819	9.8655053	10.1344947	44
17 9.7721593	9.9063892	9.8657702	10.1342298	43
18 9.7723314	9.9062964	9.8660350	10.1339650	42
19 9.7725033	9.9062036	9.8662997	10.1337003	41
20 9.7726751	9.9061107	9.8665644	10.1334356	40
21 9.7728468	9.9060177	9.8668291	10.1331709	39
22 9.7730185	9.9059247	9.8670937	10.1329063	38
23 9.7731900	9.9058317	9.8673583	10.1326417	37
24 9.7733614	9.9057386	9.8676228	10.1323772	36
25 9.7735327	9.9056454	9.8678873	10.1321127	35
26 9.7737039	9.9055522	9.8681517	10.1318483	34
27 9.7738749	9.9054589	9.8684160	10.1315840	33
28 9.7740459	9.9053656	9.8686804	10.1313196	32
29 9.7742168	9.9052722	9.8689446	10.1310554	31
30 9.7743876	9.9051787	9.8692089	10.1307911	30
Sine Complement.	Sine	Tangent Complement.	Tang.	Minut.

53 Degrees.

36 Degrees.

Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	Minut.
60	9.7743876	9.9051787	9.8692089	10.1307911	30
59	9.7745583	9.9050852	9.8694731	10.1305269	29
58	9.7747288	9.9049916	9.8697372	10.1302628	28
57	9.7748993	9.9048980	9.8700013	10.1299987	27
56	9.7750697	9.9048043	9.8702653	10.1297347	26
55	9.7752399	9.9047106	9.8705293	10.1294707	25
54	9.7754101	9.9046168	9.8707933	10.1292067	24
53	9.7755801	9.9045230	9.8710572	10.1289428	23
52	9.7757501	9.9044291	9.8713210	10.1286790	22
51	9.7759199	9.9043351	9.8715848	10.1284152	21
50	9.7760897	9.9042411	9.8718486	10.1281514	20
49	9.7762593	9.9041470	9.8721123	10.1278877	19
48	9.7764289	9.9040529	9.8723760	10.1276240	18
47	9.7765983	9.9039587	9.8726396	10.1273604	17
46	9.7767676	9.9038644	9.8729032	10.1270968	16
45	9.7769369	9.9037701	9.8731668	10.1268332	15
44	9.7771060	9.9036757	9.8734302	10.1265698	14
43	9.7772750	9.9035813	9.8736937	10.1263063	13
42	9.7774439	9.9034868	9.8739571	10.1260429	12
41	9.7776128	9.9033923	9.8742204	10.1257796	11
40	9.7777815	9.9032977	9.8744838	10.1255162	10
39	9.7779501	9.9032031	9.8747470	10.1252530	9
38	9.7781186	9.9031084	9.8750102	10.1249898	8
37	9.7782870	9.9030136	9.8752734	10.1247266	7
36	9.7784553	9.9029188	9.8755365	10.1244635	6
35	9.7786235	9.9028239	9.8757996	10.1242004	5
34	9.7787916	9.9027289	9.8760627	10.1239373	4
33	9.7789596	9.9026339	9.8763257	10.1236743	3
32	9.7791275	9.9025389	9.8765886	10.1234114	2
31	9.7792953	9.9024438	9.8768515	10.1231485	1
30	9.7794630	9.9023486	9.8771144	10.1228856	0
	Sine Complement.	Sine	Tangent Complement.	Tang.	Minut.

53 Degrees.

37 Degrees.

Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	Minut.
0	9.7794630	9.9023486	9.8771144	10.1228856	60
1	9.7796306	9.9022534	9.8773772	10.1226228	59
2	9.7797981	9.9021581	9.8776400	10.1223600	58
3	9.7799655	9.9020628	9.8779027	10.1220973	57
4	9.7801328	9.9019674	9.8781654	10.1218346	56
5	9.7803000	9.9018719	9.8784281	10.1215719	55
6	9.7804671	9.9017764	9.8786907	10.1213093	54
7	9.7806341	9.9016808	9.8789533	10.1210467	53
8	9.7808010	9.9015852	9.8792158	10.1207842	52
9	9.7809677	9.9014895	9.8794782	10.1205218	51
10	9.7811344	9.9013938	9.8797407	10.1202593	50
11	9.7813010	9.9012980	9.8800031	10.1199969	49
12	9.7814675	9.9012021	9.8802654	10.1197346	48
13	9.7816339	9.9011062	9.8805277	10.1194723	47
14	9.7818002	9.9010102	9.8807900	10.1192100	46
15	9.7819664	9.9009142	9.8810522	10.1189478	45
16	9.7821324	9.9008181	9.8813144	10.1186856	44
17	9.7822984	9.9007219	9.8815765	10.1184235	43
18	9.7824643	9.9006257	9.8818386	10.1181614	42
19	9.7826301	9.9005294	9.8821007	10.1178993	41
20	9.7827958	9.9004331	9.8823627	10.1176373	40
21	9.7829614	9.9003367	9.8826246	10.1173754	39
22	9.7831268	9.9002403	9.8828866	10.1171134	38
23	9.7832922	9.9001438	9.8831484	10.1168516	37
24	9.7834575	9.9000472	9.8834103	10.1165897	36
25	9.7836227	9.8999506	9.8836721	10.1163279	35
26	9.7837878	9.8998539	9.8839338	10.1160662	34
27	9.7839528	9.8997572	9.8841956	10.1158044	33
28	9.7841177	9.8996604	9.8844572	10.1155428	32
29	9.7842824	9.8995636	9.8847189	10.1152811	31
30	9.7844471	9.8994667	9.8849805	10.1150195	30
	Sine Complement.	Sine	Tangent Complement.	Tang.	Minut.

52 Degrees.

37 Degrees.

37 Degrees.					
Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	
30	9.7844471	9.8994667	9.8849805	10.1150195	30
31	9.7846117	9.8993697	9.8852420	10.1147580	29
32	9.7847762	9.8992727	9.8855035	10.1144965	28
33	9.7849406	9.8991756	9.8857650	10.1142350	27
34	9.7851049	9.8990784	9.8860264	10.1139736	26
35	9.7852691	9.8989812	9.8862878	10.1137122	25
36	9.7854332	9.8988840	9.8865492	10.1134508	24
37	9.7855972	9.8987867	9.8868105	10.1131895	23
38	9.7857611	9.8986893	9.8870718	10.1129282	22
39	9.7859249	9.8985919	9.8873330	10.1126670	21
40	9.7860886	9.8984944	9.8875942	10.1124058	20
41	9.7862522	9.8983968	9.8878554	10.1121446	19
42	9.7864157	9.8982992	9.8881165	10.1118835	18
43	9.7865791	9.8982015	9.8883775	10.1116225	17
44	9.7867424	9.8981038	9.8886386	10.1113614	16
45	9.7869056	9.8980060	9.8888996	10.1111004	15
46	9.7870687	9.8979082	9.8891605	10.1108395	14
47	9.7872317	9.8978103	9.8894214	10.1105786	13
48	9.7873946	9.8977123	9.8896823	10.1103177	12
49	9.7875574	9.8976143	9.8899432	10.1100568	11
50	9.7877202	9.8975162	9.8902040	10.1097960	10
51	9.7878828	9.8974181	9.8904647	10.1095353	9
52	9.7880453	9.8973199	9.8907254	10.1092746	8
53	9.7882077	9.8972216	9.8909861	10.1090135	7
54	9.7883701	9.8971233	9.8912468	10.1087532	6
55	9.7885323	9.8970249	9.8915074	10.1084926	5
56	9.7886944	9.8969265	9.8917679	10.1082321	4
57	9.7888565	9.8968280	9.8920285	10.1079715	3
58	9.7890184	9.8967294	9.8922890	10.1077110	2
59	9.7891802	9.8966308	9.8925494	10.1074506	1
60	9.7893420	9.8965321	9.8928098	10.1071902	0
	Sine Complement.	Sine	Tangent Complement	Tang.	Minut.

52 Degrees.	
-------------	--

52 Degrees.

38 Degrees.				
Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.
0	9.7893420	9.8965321	9.8918098	10.1071902
1	9.7895036	9.8964334	9.8930702	10.1069298
2	9.7896652	9.8963346	9.8933306	10.1066694
3	9.7898266	9.8962358	9.8935909	10.1064091
4	9.7899880	9.8961369	9.8938511	10.1061489
5	9.7901493	9.8960379	9.8941114	10.1058886
6	9.7903104	9.8959389	9.8943715	10.1056285
7	9.7904715	9.8958398	9.8946317	10.1053683
8	9.7906325	9.8957406	9.8948918	10.1051082
9	9.7907933	9.8956414	9.8951519	10.1048481
10	9.7909541	9.8955422	9.8954119	10.1045881
11	9.7911148	9.8954429	9.8956719	10.1043281
12	9.7912754	9.8953435	9.8959319	10.1040681
13	9.7914359	9.8952440	9.8961918	10.1038082
14	9.7915963	9.8951445	9.8964517	10.1035483
15	9.7917566	9.8950450	9.8967116	10.1032884
16	9.7919168	9.8949453	9.8969714	10.1030286
17	9.7920769	9.8948457	9.8972312	10.1027688
18	9.7922369	9.8947459	9.8974910	10.1025090
19	9.7923968	9.8946461	9.8977507	10.1022493
20	9.7925566	9.8945463	9.8980104	10.1019896
21	9.7927163	9.8944463	9.8982700	10.1017300
22	9.7928760	9.8943464	9.8985296	10.1014704
23	9.7930355	9.8942463	9.8987892	10.1012108
24	9.7931949	9.8941462	9.8990487	10.1009513
25	9.7933543	9.8940461	9.8993082	10.1006918
26	9.7935135	9.8939458	9.8995677	10.1004323
27	9.7936727	9.8938456	9.8998271	10.1001729
28	9.7938317	9.8937452	9.9000865	10.0999135
29	9.7939907	9.8936448	9.9003459	10.0996541
30	9.7941496	9.8935444	9.9006052	10.0993948
	Sine Complement.	Sine	Tangent Complement.	Tang.
51 Degrees.				
Minut.				

38 Degrees.

Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	
30	9.7941496	9.8935444	9.9006052	10.0993948	30
31	9.7943083	9.8934439	9.9008645	10.0991355	29
32	9.7944670	9.8933433	9.9011237	10.0988763	28
33	9.7946256	9.8932426	9.9013830	10.0986170	27
34	9.7947841	9.8931419	9.9016422	10.0983578	26
35	9.7949425	9.8930412	9.9019013	10.0980987	25
36	9.7951008	9.8929404	9.9021604	10.0978396	24
37	9.7952590	9.8928395	9.9024195	10.0975805	23
38	9.7954171	9.8927385	9.9026786	10.0973214	22
39	9.7955751	9.8926375	9.9029376	10.0970624	21
40	9.7957330	9.8925365	9.9031966	10.0968034	20
41	9.7958909	9.8924354	9.9034555	10.0965445	19
42	9.7960486	9.8923342	9.9037144	10.0962856	18
43	9.7962062	9.8922329	9.9039733	10.0960267	17
44	9.7963638	9.8921316	9.9042321	10.0957679	16
45	9.7965212	9.8920303	9.9044910	10.0955090	15
46	9.7966786	9.8919289	9.9047497	10.0952503	14
47	9.7968359	9.8918274	9.9050085	10.0949915	13
48	9.7969930	9.8917258	9.9052672	10.0947328	12
49	9.7971501	9.8916242	9.9055259	10.0944741	11
50	9.7973071	9.8915226	9.9057845	10.0942155	10
51	9.7974640	9.8914208	9.9060431	10.0939569	9
52	9.7976208	9.8913191	9.9063017	10.0936983	8
53	9.7977775	9.8912172	9.9065603	10.0934397	7
54	9.7979341	9.8911153	9.9068188	10.0931812	6
55	9.7980906	9.8910133	9.9070773	10.0929227	5
56	9.7982470	9.8909113	9.9073357	10.0926643	4
57	9.7984034	9.8908092	9.9075941	10.0924059	3
58	9.7985596	9.8907071	9.9078525	10.0921475	2
59	9.7987158	9.8906049	9.9081109	10.0918891	1
60	9.7988718	9.8905026	9.9083692	10.0916308	0
	Sine Complement.	Sine	Tangent Complement	Tang.	Minut.

51 Degrees.

39 Degrees.

Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	Minut.
0	9.7988718	9.8905026	9.9083692	10.0916308	60
1	9.7990278	9.8904003	9.9086275	10.0913725	59
2	9.7991836	9.8902979	9.9088858	10.0911142	58
3	9.7993394	9.8901954	9.9091440	10.0908560	57
4	9.7994951	9.8900929	9.9094022	10.0905978	56
5	9.7996507	9.8899903	9.9096603	10.0903397	55
6	9.7998062	9.8898877	9.9099185	10.0900815	54
7	9.7999616	9.8897850	9.9101766	10.0898234	53
8	9.8001169	9.8896822	9.9104347	10.0895653	52
9	9.8002721	9.8895794	9.9106927	10.0893073	51
10	9.8004272	9.8894765	9.9109507	10.0890493	50
11	9.8005823	9.8893736	9.9112087	10.0887913	49
12	9.8007372	9.8892706	9.9114666	10.0885334	48
13	9.8008921	9.8891675	9.9117245	10.0882755	47
14	9.8010468	9.8890644	9.9119824	10.0880176	46
15	9.8012015	9.8889612	9.9122403	10.0877597	45
16	9.8013561	9.8888580	9.9124981	10.0875019	44
17	9.8015106	9.8887547	9.9127559	10.0872441	43
18	9.8016649	9.8886513	9.9130137	10.0869863	42
19	9.8018192	9.8885479	9.9132714	10.0867286	41
20	9.8019735	9.8884444	9.9135291	10.0864709	40
21	9.8021276	9.8883408	9.9137868	10.0862132	39
22	9.8022816	9.8882372	9.9140444	10.0859556	38
23	9.8024355	9.8881335	9.9143020	10.0856980	37
24	9.8025894	9.8880298	9.9145596	10.0854404	36
25	9.8027431	9.8879260	9.9148171	10.0851829	35
26	9.8028968	9.8878221	9.9150747	10.0849253	34
27	9.8030504	9.8877182	9.9153322	10.0846678	33
28	9.8032038	9.8876142	9.9155896	10.0844104	32
29	9.8033572	9.8875102	9.9158471	10.0841529	31
30	9.8035105	9.8874061	9.9161045	10.0838955	30
	Sine Complement.	Sine	Tangent Complement.	Tang.	Minut.

50 Degrees.

39 Degrees.

Minute	Sine	Sine Complement	Tang.	Tangent Complement	Minute
30	9.8035105	9.8874061	9.9161045	10.0838955	30
31	9.8036637	9.8873019	9.9163618	10.0836382	29
32	9.8038168	9.8871977	9.9166192	10.0833808	28
33	9.8039699	9.8870934	9.9168765	10.0831235	27
34	9.8041228	9.8869890	9.9171338	10.0828662	26
35	9.8042757	9.8868846	9.9173911	10.0826089	25
36	9.8044284	9.8867801	9.9176483	10.0823517	24
37	9.8045811	9.8866756	9.9179055	10.0820945	23
38	9.8047336	9.8865710	9.9181627	10.0818373	22
39	9.8048861	9.8864663	9.9184198	10.0815802	21
40	9.8050385	9.8863616	9.9186769	10.0813231	20
41	9.8051908	9.8862568	9.9189340	10.0810660	19
42	9.8053430	9.8861519	9.9191911	10.0808089	18
43	9.8054951	9.8860470	9.9194481	10.0805519	17
44	9.8056472	9.8859420	9.9197051	10.0802949	16
45	9.8057991	9.8858370	9.9199621	10.0800379	15
46	9.8059510	9.8857319	9.9202191	10.0797809	14
47	9.8061027	9.8856267	9.9204760	10.0795240	13
48	9.8062544	9.8855215	9.9207329	10.0792671	12
49	9.8064060	9.8854162	9.9209898	10.0790102	11
50	9.8065575	9.8853109	9.9212466	10.0787534	10
51	9.8067089	9.8852055	9.9215034	10.0784966	9
52	9.8068602	9.8851000	9.9217602	10.0782398	8
53	9.8070114	9.8849945	9.9220170	10.0779830	7
54	9.8071626	9.8848889	9.9222737	10.0777263	6
55	9.8073136	9.8847832	9.9225304	10.0774696	5
56	9.8074646	9.8846775	9.9227871	10.0772129	4
57	9.8076154	9.8845717	9.9230437	10.0769563	3
58	9.8077662	9.8844659	9.9233004	10.0766996	2
59	9.8079169	9.8843599	9.9235570	10.0764430	1
60	9.8080675	9.8842540	9.9238135	10.0761865	0
	Sine Complement.	Sine.	Tangent Complement.	Tang.	Minute

50 Degrees.

40 Degrees.

Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	Minut.
0	9.8080675	9.8842540	9.9238135	10.0761865	60
1	9.8082180	9.8841479	9.9240701	10.0759299	59
2	9.8083684	9.8840418	9.9243266	10.0756734	58
3	9.8085188	9.8839357	9.9245831	10.0754169	57
4	9.8086690	9.8838294	9.9248396	10.0751604	56
5	9.8088192	9.8837232	9.9250960	10.0749040	55
6	9.8089692	9.8836168	9.9253524	10.0746476	54
7	9.8091192	9.8835104	9.9256088	10.0743912	53
8	9.8092691	9.8834039	9.9258652	10.0741348	52
9	9.8094189	9.8832974	9.9261215	10.0738785	51
10	9.8095686	9.8831908	9.9263778	10.0736222	50
11	9.8097182	9.8830841	9.9266341	10.0733659	49
12	9.8098678	9.8829774	9.9268904	10.0731096	48
13	9.8100172	9.8828706	9.9271466	10.0728534	47
14	9.8101666	9.8827638	9.9274028	10.0725972	46
15	9.8103159	9.8826568	9.9276590	10.0723410	45
16	9.8104650	9.8825499	9.9279152	10.0720848	44
17	9.8106141	9.8824428	9.9281713	10.0718287	43
18	9.8107631	9.8823357	9.9284274	10.0715726	42
19	9.8109121	9.8822285	9.9286835	10.0713165	41
20	9.8110609	9.8821213	9.9289396	10.0710604	40
21	9.8112096	9.8820140	9.9291956	10.0708044	39
22	9.8113583	9.8819067	9.9294516	10.0705484	38
23	9.8115069	9.8817992	9.9297076	10.0702924	37
24	9.8116554	9.8816918	9.9299636	10.0700364	36
25	9.8118038	9.8815842	9.9302195	10.0697805	35
26	9.8119521	9.8814766	9.9304755	10.0695245	34
27	9.8121003	9.8813689	9.9307314	10.0692686	33
28	9.8122484	9.8812612	9.9309872	10.0690128	32
29	9.8123965	9.8811534	9.9312431	10.0687569	31
30	9.8125444	9.8810455	9.9314989	10.0685011	30
	Sine Complement.	Sine	Tangent Complement.	Tang.	Minut.

49 Degrees.

40 Degrees.

Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	Minut.
30	9.8125444	9.8810455	9.9314989	10.0685011	30
31	9.8126923	9.8809376	9.9317547	10.0682453	29
32	9.8128401	9.8808296	9.9320105	10.0679895	28
33	9.8129878	9.8807215	9.9322662	10.0677338	27
34	9.8131354	9.8806134	9.9325220	10.0674780	26
35	9.8132829	9.8805052	9.9327777	10.0672223	25
36	9.8134303	9.8803970	9.9330334	10.0669666	24
37	9.8135777	9.8802887	9.9332890	10.0667110	23
38	9.8137250	9.8801803	9.9335446	10.0664554	22
39	9.8138721	9.8800719	9.9338003	10.0661997	21
40	9.8140192	9.8799634	9.9340559	10.0659441	20
41	9.8141662	9.8798548	9.9343114	10.0656886	19
42	9.8143131	9.8797462	9.9345670	10.0654330	18
43	9.8144600	9.8796375	9.9348225	10.0651775	17
44	9.8146067	9.8795287	9.9350780	10.0649220	16
45	9.8147534	9.8794199	9.9353335	10.0646665	15
46	9.8148999	9.8793110	9.9355889	10.0644111	14
47	9.8150464	9.8792021	9.9358444	10.0641556	13
48	9.8151928	9.8790930	9.9360998	10.0639002	12
49	9.8153391	9.8789840	9.9363552	10.0636448	11
50	9.8154854	9.8788748	9.9366105	10.0633895	10
51	9.8156315	9.8787656	9.9368659	10.0631341	9
52	9.8157776	9.8786563	9.9371212	10.0628788	8
53	9.8159235	9.8785470	9.9373765	10.0626235	7
54	9.8160694	9.8784376	9.9376318	10.0623682	6
55	9.8162152	9.8783281	9.9378871	10.0621129	5
56	9.8163609	9.8782186	9.9381423	10.0618577	4
57	9.8165066	9.8781090	9.9383975	10.0616025	3
58	9.8166521	9.8779994	9.9386527	10.0613473	2
59	9.8167975	9.8778896	9.9389079	10.0610921	1
60	9.8169429	9.8777799	9.9391631	10.0608369	0
	Sine Complement.	Sine.	Tangent Complement.	Tang.	

49 Degrees.

41 Degrees.					
Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	
0	9.8169429	9.8777799	9.9391631	10.0608369	60
1	9.8170881	9.8776700	9.9394182	10.0605818	59
2	9.8172334	9.8775601	9.9396733	10.0603267	58
3	9.8173785	9.8774501	9.9399284	10.0600716	57
4	9.8175235	9.8773401	9.9401835	10.0598165	56
5	9.8176685	9.8772300	9.9404385	10.0595615	55
6	9.8178133	9.8771198	9.9406936	10.0593064	54
7	9.8179581	9.8770096	9.9409486	10.0590514	53
8	9.8181028	9.8768993	9.9412036	10.0587964	52
9	9.8182474	9.8767889	9.9414585	10.0585415	51
10	9.8183919	9.8766785	9.9417135	10.0582865	50
11	9.8185364	9.8765680	9.9419684	10.0580316	49
12	9.8186807	9.8764574	9.9422233	10.0577767	48
13	9.8188250	9.8763468	9.9424782	10.0575218	47
14	9.8189692	9.8762361	9.9427331	10.0572669	46
15	9.8191133	9.8761253	9.9429879	10.0570121	45
16	9.8192573	9.8760145	9.9432428	10.0567572	44
17	9.8194012	9.8759036	9.9434976	10.0565024	43
18	9.8195450	9.8757927	9.9437524	10.0562476	42
19	9.8196888	9.8756816	9.9440072	10.0559928	41
20	9.8198325	9.8755706	9.9442619	10.0557381	40
21	9.8199761	9.8754594	9.9445166	10.0554834	39
22	9.8201196	9.8753482	9.9447714	10.0552286	38
23	9.8202630	9.8752369	9.9450261	10.0549739	37
24	9.8204063	9.8751256	9.9452807	10.0547193	36
25	9.8205496	9.8750142	9.9455354	10.0544646	35
26	9.8206927	9.8749027	9.9457900	10.0542100	34
27	9.8208358	9.8747912	9.9460447	10.0539553	33
28	9.8209788	9.8746795	9.9462993	10.0537007	32
29	9.8211217	9.8745679	9.9465539	10.0534461	31
30	9.8212646	9.8744561	9.9468084	10.0531916	30
	Sine Complement.	Sine	Tangent Complement.	Tang.	Minut.
48 Degrees.					

41 Degrees.

Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	Minut.
30	9.8212646	9.8744561	9.9468084	10.0531916	30
31	9.8214073	9.8743443	9.9470630	10.0529370	29
32	9.8215500	9.8742325	9.9473175	10.0526825	28
33	9.8216926	9.8741205	9.9475720	10.0524280	27
34	9.8218351	9.8740085	9.9478265	10.0521735	26
35	9.8219775	9.8738965	9.9480810	10.0519190	25
36	9.8221198	9.8737844	9.9483355	10.0516645	24
37	9.8222621	9.8736722	9.9485899	10.0514101	23
38	9.8224042	9.8735599	9.9488443	10.0511557	22
39	9.8225463	9.8734476	9.9490987	10.0509013	21
40	9.8226883	9.8733352	9.9493531	10.0506469	20
41	9.8228302	9.8732227	9.9496075	10.0503925	19
42	9.8229721	9.8731102	9.9498619	10.0501381	18
43	9.8231138	9.8729976	9.9501162	10.0498838	17
44	9.8232555	9.8728849	9.9503705	10.0496295	16
45	9.8233971	9.8727722	9.9506248	10.0493752	15
46	9.8235386	9.8726594	9.9508791	10.0491209	14
47	9.8236800	9.8725466	9.9511334	10.0488666	13
48	9.8238213	9.8724337	9.9513876	10.0486124	12
49	9.8239626	9.8723207	9.9516419	10.0483581	11
50	9.8241037	9.8722076	9.9518961	10.0481039	10
51	9.8242448	9.8720945	9.9521503	10.0478497	9
52	9.8243858	9.8719813	9.9524045	10.0475955	8
53	9.8245267	9.8718681	9.9526587	10.0473413	7
54	9.8246676	9.8717548	9.9529128	10.0470872	6
55	9.8248083	9.8716414	9.9531670	10.0468330	5
56	9.8249490	9.8715279	9.9534211	10.0465789	4
57	9.8250896	9.8714144	9.9536752	10.0463248	3
58	9.8252301	9.8713008	9.9539293	10.0460707	2
59	9.8253705	9.8711872	9.9541834	10.0458166	1
60	9.8255109	9.8710735	9.9544374	10.0455626	0
	Sine Complement.	Sine	Tangent Complement.	Tang.	Minut.

48 Degrees.

42 Degrees.

Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	Minut.
0	9.8255109	9.8710735	9.9544374	10.0455626	60
1	9.8256512	9.8709597	9.9546915	10.0453085	59
2	9.8257913	9.8708458	9.9549455	10.0450545	58
3	9.8259314	9.8707319	9.9551995	10.0448005	57
4	9.8260715	9.8706179	9.9554535	10.0445465	56
5	9.8262114	9.8705039	9.9557075	10.0442925	55
6	9.8263512	9.8703898	9.9559615	10.0440385	54
7	9.8264910	9.8702756	9.9562154	10.0437846	53
8	9.8266307	9.8701613	9.9564694	10.0435306	52
9	9.8267703	9.8700470	9.9567233	10.0432767	51
10	9.8269098	9.8699326	9.9569772	10.0430228	50
11	9.8270493	9.8698182	9.9572311	10.0427689	49
12	9.8271887	9.8697037	9.9574850	10.0425150	48
13	9.8273279	9.8695891	9.9577389	10.0422611	47
14	9.8274671	9.8694744	9.9579927	10.0420073	46
15	9.8276063	9.8693597	9.9582465	10.0417535	45
16	9.8277453	9.8692449	9.9585004	10.0414996	44
17	9.8278843	9.8691301	9.9587542	10.0412458	43
18	9.8280231	9.8690152	9.9590080	10.0409920	42
19	9.8281619	9.8689002	9.9592618	10.0407382	41
20	9.8283006	9.8687851	9.9595155	10.0404845	40
21	9.8284393	9.8686700	9.9597693	10.0402307	39
22	9.8285778	9.8685548	9.9600230	10.0399770	38
23	9.8287163	9.8684396	9.9602767	10.0397233	37
24	9.8288547	9.8683242	9.9605305	10.0394695	36
25	9.8289930	9.8682088	9.9607842	10.0392158	35
26	9.8291312	9.8680934	9.9610378	10.0389622	34
27	9.8292694	9.8679779	9.9612915	10.0387085	33
28	9.8294075	9.8678623	9.9615452	10.0384548	32
29	9.8295454	9.8677466	9.9617988	10.0382012	31
30	9.8296833	9.8676309	9.9620525	10.0379475	30
Sine Complement.	Sine		Tangent Complement.	Tang.	

47 Degrees.

42 Degrees.

Minut.	Sine	Sine Complement	Tang.	Tangent Complement.	Minut.
30	9.8296833	9.8676309	9.9620525	10.0379475	30
31	9.8298212	9.8675151	9.9623061	10.0376939	29
32	9.8299589	9.8673992	9.9625597	10.0374403	28
33	9.8300966	9.8672833	9.9628133	10.0371867	27
34	9.8302342	9.8671673	9.9630669	10.0369331	26
35	9.8303717	9.8670512	9.9633204	10.0366796	25
36	9.8305091	9.8669351	9.9635740	10.0364260	24
37	9.8306464	9.8668189	9.9638275	10.0361725	23
38	9.8307837	9.8667026	9.9640811	10.0359189	22
39	9.8309209	9.8665863	9.9643346	10.0356654	21
40	9.8310580	9.8664699	9.9645881	10.0354119	20
41	9.8311950	9.8663534	9.9648416	10.0351584	19
42	9.8313320	9.8662369	9.9650951	10.0349049	18
43	9.8314688	9.8661203	9.9653486	10.0346514	17
44	9.8316056	9.8660036	9.9656020	10.0343980	16
45	9.8317423	9.8658868	9.9658555	10.0341445	15
46	9.8318789	9.8657700	9.9661089	10.0338911	14
47	9.8320155	9.8656531	9.9663623	10.0336377	13
48	9.8321519	9.8655362	9.9666157	10.0333843	12
49	9.8322883	9.8654192	9.9668692	10.0331308	11
50	9.8324246	9.8653021	9.9671225	10.0328775	10
51	9.8325609	9.8651849	9.9673759	10.0326241	9
52	9.8326970	9.8650677	9.9676293	10.0323707	8
53	9.8328331	9.8649504	9.9678827	10.0321173	7
54	9.8329691	9.8648331	9.9681360	10.0318640	6
55	9.8331050	9.8647156	9.9683893	10.0316107	5
56	9.8332408	9.8645981	9.9686427	10.0313573	4
57	9.8333766	9.8644806	9.9688960	10.0311040	3
58	9.8335122	9.8643629	9.9691493	10.0308507	2
59	9.8336478	9.8642452	9.9694026	10.0305974	1
60	9.8337833	9.8641275	9.9696559	10.0303441	0
	Sine Complement.	Sine	Tangent Complement.	Tang.	

47 Degrees.

43 Degrees.

Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	Minut.
0	9.8337833	9.8641275	9.9696559	10.0303441	60
1	9.8339188	9.8640096	9.9699091	10.0300909	59
2	9.8340541	9.8638917	9.9701624	10.0298376	58
3	9.8341894	9.8637737	9.9704157	10.0295843	57
4	9.8343246	9.8636557	9.9706689	10.0293311	56
5	9.8344597	9.8635376	9.9709221	10.0290779	55
6	9.8345948	9.8634194	9.9711754	10.0288246	54
7	9.8347297	9.8633011	9.9714286	10.0285714	53
8	9.8348646	9.8631828	9.9716818	10.0283182	52
9	9.8349994	9.8630644	9.9719350	10.0280650	51
10	9.8351341	9.8629460	9.9721882	10.0278118	50
11	9.8352688	9.8628274	9.9724413	10.0275587	49
12	9.8354033	9.8627088	9.9726945	10.0273055	48
13	9.8355378	9.8625902	9.9729477	10.0270523	47
14	9.8356722	9.8624714	9.9732008	10.0267992	46
15	9.8358066	9.8623526	9.9734539	10.0265461	45
16	9.8359408	9.8622338	9.9737071	10.0262929	44
17	9.8360750	9.8621148	9.9739602	10.0260398	43
18	9.8362091	9.8619958	9.9742133	10.0257867	42
19	9.8363431	9.8618767	9.9744664	10.0255336	41
20	9.8364771	9.8617576	9.9747195	10.0252805	40
21	9.8366109	9.8616383	9.9749726	10.0250274	39
22	9.8367447	9.8615190	9.9752257	10.0247743	38
23	9.8368784	9.8613997	9.9754787	10.0245213	37
24	9.8370121	9.8612803	9.9757318	10.0242682	36
25	9.8371456	9.8611608	9.9759849	10.0240151	35
26	9.8372791	9.8610412	9.9762379	10.0237621	34
27	9.8374125	9.8609215	9.9764909	10.0235091	33
28	9.8375458	9.8608018	9.9767440	10.0232560	32
29	9.8376790	9.8606821	9.9769970	10.0230030	31
30	9.8378122	9.8605622	9.9772500	10.0227500	30
	Sine Complement.	Sine	Tangent Complement.	Tang.	Minut.

46 Degrees.

43 Degrees.

43 Degrees.					
Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	
30	9.8378122	9.8605622	9.9772500	10.0227500	30
31	9.8379453	9.8604423	9.9775030	10.0224970	19
32	9.8380783	9.8603223	9.9777560	10.0222440	18
33	9.8382112	9.8602022	9.9780090	10.0219910	17
34	9.8383441	9.8600821	9.9782620	10.0217380	16
35	9.8384769	9.8599619	9.9785149	10.0214851	15
36	9.8386096	9.8598416	9.9787679	10.0212321	14
37	9.8387422	9.8597213	9.9790209	10.0209791	13
38	9.8388747	9.8596009	9.9792738	10.0207262	12
39	9.8390072	9.8594804	9.9795268	10.0204732	11
40	9.8391396	9.8593599	9.9797797	10.0202203	10
41	9.8392719	9.8592393	9.9800326	10.0199674	19
42	9.8394041	9.8591186	9.9802856	10.0197144	18
43	9.8395363	9.8589978	9.9805385	10.0194615	17
44	9.8396684	9.8588770	9.9807914	10.0192086	16
45	9.8398004	9.8587561	9.9810443	10.0189557	15
46	9.8399323	9.8586351	9.9812972	10.0187028	14
47	9.8400642	9.8585141	9.9815501	10.0184499	13
48	9.8401959	9.8583929	9.9818030	10.0181970	12
49	9.8403276	9.8582718	9.9820559	10.0179441	11
50	9.8404593	9.8581505	9.9823087	10.0176913	10
51	9.8405908	9.8580292	9.9825616	10.0174384	9
52	9.8407223	9.8579078	9.9828145	10.0171855	8
53	9.8408537	9.8577863	9.9830673	10.0169327	7
54	9.8409850	9.8576648	9.9833202	10.0166798	6
55	9.8411162	9.8575432	9.9835730	10.0164270	5
56	9.8412474	9.8574215	9.9838259	10.0161741	4
57	9.8413785	9.8572998	9.9840787	10.0159213	3
58	9.8415095	9.8571779	9.9843315	10.0156685	2
59	9.8416404	9.8570561	9.9845844	10.0154156	1
60	9.8417713	9.8569341	9.9848372	10.0151628	0
	Sine Complement.	Sine	Tangent Complement	Tang.	Minut.

46 Degrees.	
-------------	--

46 Degrees.

44 Degrees.				
Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.
0	9.8417712	9.8569341	9.9848372	10.0151628
1	9.8419021	9.8568121	9.9850900	10.0149100
2	9.8420328	9.8566900	9.9853428	10.0146572
3	9.8421634	9.8565678	9.9855956	10.0144044
4	9.8422939	9.8564455	9.9858484	10.0141516
5	9.8424244	9.8563232	9.9861012	10.0138988
6	9.8425548	9.8562008	9.9863540	10.0136460
7	9.8426851	9.8560784	9.9866068	10.0133932
8	9.8428154	9.8559558	9.9868596	10.0131404
9	9.8429456	9.8558332	9.9871123	10.0128877
10	9.8430757	9.8557106	9.9873651	10.0126349
11	9.8432057	9.8555878	9.9876179	10.0123821
12	9.8433356	9.8554650	9.9878706	10.0121294
13	9.8434655	9.8553421	9.9881234	10.0118766
14	9.8435953	9.8552192	9.9883761	10.0116239
15	9.8437250	9.8550961	9.9886289	10.0113711
16	9.8438547	9.8549730	9.9888816	10.0111184
17	9.8439842	9.8548499	9.9891344	10.0108656
18	9.8441137	9.8547266	9.9893871	10.0106129
19	9.8442432	9.8546033	9.9896399	10.0103601
20	9.8443725	9.8544799	9.9898926	10.0101074
21	9.8445018	9.8543564	9.9901453	10.0098547
22	9.8446310	9.8542329	9.9903981	10.0096019
23	9.8447601	9.8541093	9.9906508	10.0093492
24	9.8448891	9.8539856	9.9909035	10.0090965
25	9.8450181	9.8538619	9.9911562	10.0088438
26	9.8451470	9.8537381	9.9914089	10.0085911
27	9.8452758	9.8536142	9.9916616	10.0083384
28	9.8454045	9.8534902	9.9919143	10.0080857
29	9.8455332	9.8533662	9.9921670	10.0078330
30	9.8456618	9.8532421	9.9924197	10.0075803
Sine Complement.	Sine	Tangent Complement.	Tang.	Minut.

45 Degrees.

44 Degrees.

Minut.	Sine	Sine Complement.	Tang.	Tangent Complement.	Minut.
30	9.8456618	9.8532421	9.9924197	10.0075803	30
31	9.8457903	9.8531179	9.9926724	10.0073276	29
32	9.8459188	9.8529936	9.9929251	10.0070749	28
33	9.8460471	9.8528693	9.9931778	10.0068222	27
34	9.8461754	9.8527449	9.9934305	10.0065695	26
35	9.8463036	9.8526204	9.9936832	10.0063168	25
36	9.8464318	9.8524959	9.9939359	10.0060641	24
37	9.8465599	9.8523713	9.9941886	10.0058114	23
38	9.8466879	9.8522466	9.9944413	10.0055587	22
39	9.8468158	9.8521218	9.9946940	10.0053060	21
40	9.8469436	9.8519970	9.9949466	10.0050534	20
41	9.8470714	9.8518721	9.9951993	10.0048007	19
42	9.8471991	9.8517471	9.9954520	10.0045480	18
43	9.8473267	9.8516220	9.9957047	10.0042953	17
44	9.8474543	9.8514969	9.9959573	10.0040427	16
45	9.8475817	9.8513712	9.9962100	10.0037900	15
46	9.8477091	9.8512465	9.9964627	10.0035373	14
47	9.8478365	9.8511211	9.9967154	10.0032846	13
48	9.8479637	9.8509957	9.9969680	10.0030320	12
49	9.8480909	9.8508702	9.9972207	10.0027793	11
50	9.8482180	9.8507446	9.9974734	10.0025266	10
51	9.8483450	9.8506190	9.9977260	10.0022740	9
52	9.8484720	9.8504933	9.9979787	10.0020213	8
53	9.8485989	9.8503675	9.9982314	10.0017686	7
54	9.8487257	9.8502417	9.9984840	10.0015160	6
55	9.8488524	9.8501157	9.9987367	10.0012633	5
56	9.8489791	9.8499897	9.9989893	10.0010107	4
57	9.8491057	9.8498637	9.9992420	10.0007580	3
58	9.8492322	9.8497375	9.9994947	10.0005053	2
59	9.8493586	9.8496113	9.9997473	10.0002527	1
60	9.8494850	9.8494850	10.0000000	10.0000000	0
Sine Complement.	Sine	Tangent Complement	Tang.		Minut.

45 Degrees.



TWO
CHILIADS
OR THE
Logarithms
OF
ABSOLUTE NUMBERS
From an Unite to 2000.



Num	Logarithm	Num	Logarithm	Num	Logarithm
1	0.0000000	34	1.5314789	67	1.8260748
2	0.3010300	35	1.5440680	68	1.8325089
3	0.4771212	36	1.5563025	69	1.8388491
4	0.6020600	37	1.5682017	70	1.8450980
5	0.6989700	38	1.5797836	71	1.8512583
6	0.7781512	39	1.5910646	72	1.8573325
7	0.8450980	40	1.6020600	73	1.8633229
8	0.9030900	41	1.6127839	74	1.8692317
9	0.9542425	42	1.6232493	75	1.8750613
10	1.0000000	43	1.6334685	76	1.8808136
11	1.0413927	44	1.6434527	77	1.8864907
12	1.0791812	45	1.6532125	78	1.8921094
13	1.1139433	46	1.6627578	79	1.8976271
14	1.1461280	47	1.6720979	80	1.9030900
15	1.1760913	48	1.6812412	81	1.9084850
16	1.2041200	49	1.6901961	82	1.9138138
17	1.2304489	50	1.6989700	83	1.9190781
18	1.2552725	51	1.7075702	84	1.9242793
19	1.2787536	52	1.7160033	85	1.9294189
20	1.3010300	53	1.7242759	86	1.9344984
21	1.3222193	54	1.7323938	87	1.9395192
22	1.3424227	55	1.7403627	88	1.9444827
23	1.3617278	56	1.7481880	89	1.9493900
24	1.3802112	57	1.7558748	90	1.9542425
25	1.3979400	58	1.7634280	91	1.9590414
26	1.4149733	59	1.7708520	92	1.9637878
27	1.4313638	60	1.7781512	93	1.9684829
28	1.4471580	61	1.7853298	94	1.9731278
29	1.4623980	62	1.7923917	95	1.9777236
30	1.4771212	63	1.7993405	96	1.9822712
31	1.4913617	64	1.8061800	97	1.9867717
32	1.5051500	65	1.8129133	98	1.9912261
33	1.5185139	66	1.8195435	99	1.9956352
34	1.5314789	67	1.8260748	100	2.0000000

Num	Logarithm	Num	Logarithm	Num	Logarithm
101	2.0043214	134	2.1271048	167	2.2227165
102	2.0086002	135	2.1303338	168	2.2253093
103	2.0128372	136	2.1335389	169	2.2278867
104	2.0170333	137	2.1367206	170	2.2304489
105	2.0211893	138	2.1398791	171	2.2329961
106	2.0253059	139	2.1430148	172	2.2355284
107	2.0293838	140	2.1461280	173	2.2380461
108	2.0334238	141	2.1492191	174	2.2405492
109	2.0374265	142	2.1522883	175	2.2430380
110	2.0413927	143	2.1553360	176	2.2455127
111	2.0453230	144	2.1583625	177	2.2479733
112	2.0492180	145	2.1613680	178	2.2504200
113	2.0530784	146	2.1643528	179	2.2528530
114	2.0569048	147	2.1673173	180	2.2552725
115	2.0606978	148	2.1702617	181	2.2576786
116	2.0644580	149	2.1731863	182	2.2600714
117	2.0681859	150	2.1760913	183	2.2624511
118	2.0718820	151	2.1789769	184	2.2648178
119	2.0755470	152	2.1818436	185	2.2671717
120	2.0791812	153	2.1846914	186	2.2695129
121	2.0827854	154	2.1875207	187	2.2718416
122	2.0863598	155	2.1903317	188	2.2741578
123	2.0899051	156	2.1931246	189	2.2764618
124	2.0934217	157	2.1958996	190	2.2787536
125	2.0969100	158	2.1986571	191	2.2810334
126	2.1003705	159	2.2013971	192	2.2833012
127	2.1038037	160	2.2041200	193	2.2855573
128	2.1072100	161	2.2068259	194	2.2878017
129	2.1105897	162	2.2095150	195	2.2900346
130	2.1139433	163	2.2121876	196	2.2922561
131	2.1172713	164	2.2148438	197	2.2944662
132	2.1205739	165	2.2174839	198	2.2966652
133	2.1238516	166	2.2201081	199	2.2988531
134	2.1271048	167	2.2227165	200	2.3010300

Num	Logarithm	Num	Logarithm	Num	Logarithm
201	2.3031961	234	2.3692159	267	2.4265113
202	2.3053514	235	2.3710679	268	2.4281348
203	2.3074960	236	2.3729120	269	2.4297523
204	2.3096302	237	2.3747483	270	2.4313638
205	2.3117539	238	2.3765770	271	2.4329693
206	2.3138672	239	2.3783979	272	2.4345689
207	2.3159703	240	2.3802112	273	2.4361626
208	2.3180633	241	2.3820170	274	2.4377506
209	2.3201463	242	2.3838154	275	2.4393327
210	2.3222193	243	2.3856063	276	2.4409091
211	2.3242824	244	2.3873898	277	2.4424798
212	2.3263359	245	2.3891661	278	2.4440448
213	2.3283796	246	2.3909351	279	2.4456042
214	2.3304138	247	2.3926969	280	2.4471580
215	2.3324385	248	2.3944517	281	2.4487063
216	2.3344537	249	2.3961993	282	2.4502491
217	2.3364597	250	2.3979400	283	2.4517864
218	2.3384565	251	2.3996737	284	2.4533183
219	2.3404441	252	2.4014005	285	2.4548449
220	2.3424227	253	2.4031205	286	2.4563660
221	2.3443923	254	2.4048337	287	2.4578819
222	2.3463530	255	2.4065402	288	2.4593925
223	2.3483049	256	2.4082400	289	2.4608978
224	2.3502480	257	2.4099331	290	2.4623980
225	2.3521825	258	2.4116197	291	2.4638930
226	2.3541084	259	2.4132998	292	2.4653828
227	2.3560259	260	2.4149733	293	2.4668676
228	2.3579348	261	2.4166405	294	2.4683473
229	2.3598355	262	2.4183013	295	2.4698220
230	2.3617278	263	2.4199557	296	2.4712917
231	2.3636120	264	2.4216039	297	2.4727564
232	2.3654880	265	2.4232459	298	2.4742163
233	2.3673559	266	2.4248816	299	2.4756712
234	2.3692159	267	2.4265113	300	2.4771212

Num	Logarithm	Num	Logarithm	Num	Logarithm
301	2.4785665	334	2.5237465	367	2.5646661
302	2.4800069	335	2.5250448	368	2.5658478
303	2.4814426	336	2.5263393	369	2.5670264
304	2.4828736	337	2.5276299	370	2.5682017
305	2.4842998	338	2.5289167	371	2.5693729
306	2.4857214	339	2.5301997	372	2.5705429
307	2.4871384	340	2.5314789	373	2.5717088
308	2.4885507	341	2.5327544	374	2.5728716
309	2.4899585	342	2.5340261	375	2.5740313
310	2.4913617	343	2.5352941	376	2.5751878
311	2.4927604	344	2.5365584	377	2.5763413
312	2.4941546	345	2.5378191	378	2.5774918
313	2.4955443	346	2.5390761	379	2.5786392
314	2.4969296	347	2.5403295	380	2.5797836
315	2.4983105	348	2.5415792	381	2.5809250
316	2.4996871	349	2.5428254	382	2.5820634
317	2.5010593	350	2.5440680	383	2.5831988
318	2.5024271	351	2.5453071	384	2.5843312
319	2.5037907	352	2.5465427	385	2.5854607
320	2.5051500	353	2.5477747	386	2.5865873
321	2.5065050	354	2.5490033	387	2.5877110
322	2.5078559	355	2.5502283	388	2.5888317
323	2.5092025	356	2.5514500	389	2.5899496
324	2.5105450	357	2.5526682	390	2.5910646
325	2.5118834	358	2.5538830	391	2.5921768
326	2.5132176	359	2.5550944	392	2.5932861
327	2.5145477	360	2.5563025	393	2.5943925
328	2.5158738	361	2.5575072	394	2.5954962
329	2.5171959	362	2.5587086	395	2.5965971
330	2.5185139	363	2.5599066	396	2.5976952
331	2.5198280	364	2.5611014	397	2.5987905
332	2.5211381	365	2.5622929	398	2.5998831
333	2.5224442	366	2.5634811	399	2.6009729
334	2.5237465	367	2.5646661	400	2.6020600

Num	Logarithm	Num	Logarithm	Num	Logarithm
401	2.6031444	434	2.6374897	467	2.6693169
402	2.6042260	435	2.6384893	468	2.6702458
403	2.6053050	436	2.6394865	469	2.6711728
404	2.6063814	437	2.6404814	470	2.6720979
405	2.6074550	438	2.6414741	471	2.6730209
406	2.6085260	439	2.6424645	472	2.6739420
407	2.6095944	440	2.6434527	473	2.6748611
408	2.6106602	441	2.6444386	474	2.6757783
409	2.6117233	442	2.6454223	475	2.6766936
410	2.6127839	443	2.6464037	476	2.6776069
411	2.6138418	444	2.6473830	477	2.6785184
412	2.6148972	445	2.6483600	478	2.6794279
413	2.6159500	446	2.6493349	479	2.6803355
414	2.6170003	447	2.6503075	480	2.6812412
415	2.6180481	448	2.6512780	481	2.6821451
416	2.6190933	449	2.6522463	482	2.6830470
417	2.6201360	450	2.6532125	483	2.6839471
418	2.6211763	451	2.6541765	484	2.6848454
419	2.6222140	452	2.6551384	485	2.6857417
420	2.6232493	453	2.6560982	486	2.6866363
421	2.6242821	454	2.6570558	487	2.6875290
422	2.6253124	455	2.6580114	488	2.6884198
423	2.6263404	456	2.6589648	489	2.6893089
424	2.6273659	457	2.6599162	490	2.6901961
425	2.6283889	458	2.6608655	491	2.6910815
426	2.6294096	459	2.6618127	492	2.6919651
427	2.6304279	460	2.6627578	493	2.6928469
428	2.6314438	461	2.6637009	494	2.6937269
429	2.6324573	462	2.6646420	495	2.6946052
430	2.6334685	463	2.6655810	496	2.6954817
431	2.6344773	464	2.6665180	497	2.6963564
432	2.6354837	465	2.6674529	498	2.6972293
433	2.6364879	466	2.6683859	499	2.6981005
434	2.6374897	467	2.6693169	500	2.6989700

Num	Logarithm	Num	Logarithm	Num	Logarithm
501	2.6998377	534	2.7275413	567	2.7535831
502	2.7007037	535	2.7283538	568	2.7543483
503	2.7015680	536	2.7291648	569	2.7551123
504	2.7024305	537	2.7299743	570	2.7558748
505	2.7032914	538	2.7307823	571	2.7566361
506	2.7041505	539	2.7315888	572	2.7573960
507	2.7050080	540	2.7323938	573	2.7581546
508	2.7058637	541	2.7331973	574	2.7589119
509	2.7067178	542	2.7339993	575	2.7596678
510	2.7075702	543	2.7347998	576	2.7604225
511	2.7084209	544	2.7355989	577	2.7611758
512	2.7092700	545	2.7363965	578	2.7619278
513	2.7101174	546	2.7371926	579	2.7626786
514	2.7109631	547	2.7379873	580	2.7634280
515	2.7118072	548	2.7387806	581	2.7641761
516	2.7126497	549	2.7395723	582	2.7649230
517	2.7134905	550	2.7403627	583	2.7656685
518	2.7143298	551	2.7411516	584	2.7664128
519	2.7151674	552	2.7419391	585	2.7671559
520	2.7160033	553	2.7427251	586	2.7678976
521	2.7168377	554	2.7435098	587	2.7686381
522	2.7176705	555	2.7442930	588	2.7693773
523	2.7185017	556	2.7450748	589	2.7701153
524	2.7193313	557	2.7458552	590	2.7708520
525	2.7201593	558	2.7466342	591	2.7715875
526	2.7209857	559	2.7474118	592	2.7723217
527	2.7218106	560	2.7481880	593	2.7730547
528	2.7226339	561	2.7489629	594	2.7737864
529	2.7234557	562	2.7497363	595	2.7745170
530	2.7242759	563	2.7505084	596	2.7752463
531	2.7250945	564	2.7512791	597	2.7759743
532	2.7259116	565	2.7520484	598	2.7767012
533	2.7267272	566	2.7528164	599	2.7774268
534	2.7275413	567	2.7535831	600	2.7781513

Num	Logarithm	Num	Logarithm	Num	Logarithm
601	2.7788745	634	2.8020893	667	2.8241258
602	2.7795965	635	2.8027737	668	2.8242765
603	2.7803173	636	2.8034571	669	2.8254261
604	2.7810369	637	2.8041394	670	2.8260748
605	2.7817554	638	2.8048207	671	2.8267225
606	2.7824726	639	2.8055009	672	2.8273693
607	2.7831887	640	2.8061800	673	2.8280151
608	2.7839036	641	2.8068580	674	2.8286599
609	2.7846173	642	2.8075350	675	2.8293038
610	2.7853298	643	2.8082110	676	2.8299467
611	2.7860412	644	2.8088859	677	2.8305887
612	2.7867514	645	2.8095597	678	2.8312297
613	2.7874605	646	2.8102325	679	2.8318698
614	2.7881684	647	2.8109043	680	2.8325099
615	2.7888751	648	2.8115750	681	2.8331471
616	2.7895807	649	2.8122447	682	2.8337844
617	2.7902852	650	2.8129134	683	2.8344207
618	2.7909885	651	2.8135810	684	2.8350561
619	2.7916906	652	2.8142476	685	2.8356906
620	2.7923917	653	2.8149132	686	2.8363241
621	2.7930916	654	2.8155777	687	2.8369567
622	2.7937904	655	2.8162413	688	2.8375884
623	2.7944880	656	2.8169038	689	2.8382192
624	2.7951846	657	2.8175654	690	2.8388491
625	2.7958800	658	2.8182259	691	2.8394780
626	2.7965744	659	2.8188854	692	2.8401061
627	2.7972675	660	2.8195439	693	2.8407332
628	2.7979596	661	2.8202015	694	2.8413595
629	2.7986506	662	2.8208580	695	2.8419848
630	2.7993405	663	2.8215135	696	2.8426092
631	2.8000294	664	2.8221681	697	2.8432328
632	2.8007171	665	2.8228216	698	2.8438554
633	2.8014037	666	2.8234742	699	2.8444772
634	2.8020893	667	2.8241258	700	2.8450980

Num	Logarithm	Num	Logarithm	Num	Logarithm
701	2.8457180	734	2.8656961	767	2.8847954
702	2.8463371	735	2.8662873	768	2.8853612
703	2.8469553	736	2.8668778	769	2.8859263
704	2.8475727	737	2.8674675	770	2.8864907
705	2.8481891	738	2.8680564	771	2.8870544
706	2.8488047	739	2.8686444	772	2.8876173
707	2.8494194	740	2.8692317	773	2.8881795
708	2.8500333	741	2.8698182	774	2.8887410
709	2.8506462	742	2.8704039	775	2.8893017
710	2.8512583	743	2.8709888	776	2.8898617
711	2.8518696	744	2.8715729	777	2.8904210
712	2.8524800	745	2.8721563	778	2.8909796
713	2.8530895	746	2.8727388	779	2.8915375
714	2.8536982	747	2.8733206	780	2.8920946
715	2.8543060	748	2.8739016	781	2.8926510
716	2.8549130	749	2.8744818	782	2.8932067
717	2.8555191	750	2.8750613	783	2.8937618
718	2.8561244	751	2.8756399	784	2.8943161
719	2.8567289	752	2.8762178	785	2.8948696
720	2.8573325	753	2.8767950	786	2.8954225
721	2.8579353	754	2.8773713	787	2.8959747
722	2.8585372	755	2.8779469	788	2.8965262
723	2.8591383	756	2.8785218	789	2.8970770
724	2.8597386	757	2.8790959	790	2.8976271
725	2.8603380	758	2.8796692	791	2.8981765
726	2.8609366	759	2.8802418	792	2.8987252
727	2.8615344	760	2.8808136	793	2.8992732
728	2.8621314	761	2.8813847	794	2.8998205
729	2.8627275	762	2.8819550	795	2.9003671
730	2.8633229	763	2.8825245	796	2.9009131
731	2.8639174	764	2.8830934	797	2.9014583
732	2.8645111	765	2.8836614	798	2.9020029
733	2.8651040	766	2.8842288	799	2.9025468
734	2.8656961	767	2.8847954	800	2.9030900

Num	Logarithm	Num	Logarithm	Num	Logarithm
801	2.9036325	834	2.9211660	867	2.9380191
802	2.9041744	835	2.9216865	868	2.9385197
803	2.9047155	836	2.9222063	869	2.9390198
804	2.9052560	837	2.9227254	870	2.9395192
805	2.9057959	838	2.9232440	871	2.9400181
806	2.9063350	839	2.9237620	872	2.9405165
807	2.9068735	840	2.9242793	873	2.9410142
808	2.9074114	841	2.9247960	874	2.9415114
809	2.9079485	842	2.9253121	875	2.9420080
810	2.9084850	843	2.9258276	876	2.9425041
811	2.9090208	844	2.9263424	877	2.9429996
812	2.9095560	845	2.9268567	878	2.9434945
813	2.9100905	846	2.9273704	879	2.9439889
814	2.9106244	847	2.9278834	880	2.9444827
815	2.9111576	848	2.9283958	881	2.9449759
816	2.9116901	849	2.9289077	882	2.9454686
817	2.9122220	850	2.9294189	883	2.9459607
818	2.9127533	851	2.9299296	884	2.9464523
819	2.9132839	852	2.9304396	885	2.9469433
820	2.9138138	853	2.9309490	886	2.9474337
821	2.9143431	854	2.9314579	887	2.9479236
822	2.9148718	855	2.9319661	888	2.9484130
823	2.9153998	856	2.9324738	889	2.9489018
824	2.9159272	857	2.9329808	890	2.9493900
825	2.9164539	858	2.9334873	891	2.9498777
826	2.9169800	859	2.9339932	892	2.9503648
827	2.9175055	860	2.9344984	893	2.9508514
828	2.9180303	861	2.9350031	894	2.9513375
829	2.9185545	862	2.9355073	895	2.9518230
830	2.9190781	863	2.9360108	896	2.9523080
831	2.9196010	864	2.9365137	897	2.9527924
832	2.9201233	865	2.9370161	899	2.9532763
833	2.9206450	866	2.9375179	898	2.9537597
834	2.9211660	867	2.9380191	900	2.9542425

Num	Logarithm	Num	Logarithm	Num	Logarithm
901	2.9547248	934	2.9703469	967	2.9854265
902	2.9552065	935	2.9708116	968	2.9858753
903	2.9556877	936	2.9712758	969	2.9863238
904	2.9561684	937	2.9717396	970	2.9867717
905	2.9566486	938	2.9722028	971	2.9872192
906	2.9571282	939	2.9726656	972	2.9876663
907	2.9576073	940	2.9731278	973	2.9881128
908	2.9580858	941	2.9735896	974	2.9885589
909	2.9585639	942	2.9740509	975	2.9890046
910	2.9590414	943	2.9745117	976	2.9894498
911	2.9595184	944	2.9749720	977	2.9898946
912	2.9599948	945	2.9754318	978	2.9903388
913	2.9604708	946	2.9758911	979	2.9907827
914	2.9609462	947	2.9763500	980	2.9912261
915	2.9614211	948	2.9768083	981	2.9916690
916	2.9618955	949	2.9772662	982	2.9921115
917	2.9623693	950	2.9777236	983	2.9925535
918	2.9628427	951	2.9781805	984	2.9929951
919	2.9633155	952	2.9786369	985	2.9934362
920	2.9637878	953	2.9790929	986	2.9938769
921	2.9642596	954	2.9795484	987	2.9943171
922	2.9647309	955	2.9800034	988	2.9947569
923	2.9652017	956	2.9804579	989	2.9951963
924	2.9656720	957	2.9809119	990	2.9956352
925	2.9661417	958	2.9813655	991	2.9960736
926	2.9666110	959	2.9818186	992	2.9965117
927	2.9670797	960	2.9822712	993	2.9969492
928	2.9675480	961	2.9827234	994	2.9973864
929	2.9680157	962	2.9831751	995	2.9978231
930	2.9684829	963	2.9836263	996	2.9982593
931	2.9689497	964	2.9840770	997	2.9986951
932	2.9694159	965	2.9845273	998	2.9991305
933	2.9698816	966	2.9849771	999	2.9995655
934	2.9703469	967	2.9854265	1000	3.0000000

1000

Num	Logarithm	Num	Logarithm	Num	Logarithm
1001	3.0004341	1034	3.0145205	1067	3.0281644
1002	3.0008677	1035	3.0149403	1068	3.0285712
1003	3.0013009	1036	3.0153597	1069	3.0289777
1004	3.0017337	1037	3.0157787	1070	3.0293838
1005	3.0021661	1038	3.0161973	1071	3.0297895
1006	3.0025980	1039	3.0166155	1072	3.0301948
1007	3.0030295	1040	3.0170333	1073	3.0305997
1008	3.0034605	1041	3.0174507	1074	3.0310043
1009	3.0038912	1042	3.0178677	1075	3.0314085
1010	3.0043214	1043	3.0182843	1076	3.0318123
1011	3.0047511	1044	3.0187005	1077	3.0322157
1012	3.0051805	1045	3.0191163	1078	3.0326188
1013	3.0056094	1046	3.0195317	1079	3.0330214
1014	3.0060379	1047	3.0199467	1080	3.0334237
1015	3.0064660	1048	3.0203613	1081	3.0338257
1016	3.0068937	1049	3.0207755	1082	3.0342273
1017	3.0073209	1050	3.0211893	1083	3.0346284
1018	3.0077478	1051	3.0216027	1084	3.0350293
1019	3.0081742	1052	3.0220157	1085	3.0354297
1020	3.0086002	1053	3.0224284	1086	3.0358298
1021	3.0090257	1054	3.0228406	1087	3.0362295
1022	3.0094509	1055	3.0232524	1088	3.0366289
1023	3.0098756	1056	3.0236639	1089	3.0370279
1024	3.0102999	1057	3.0240750	1090	3.0374265
1025	3.0107239	1058	3.0244857	1091	3.0378247
1026	3.0111474	1059	3.0248960	1092	3.0382226
1027	3.0115704	1060	3.0253059	1093	3.0386201
1028	3.0119931	1061	3.0257154	1094	3.0390173
1029	3.0124154	1062	3.0261245	1095	3.0394141
1030	3.0128372	1063	3.0265333	1096	3.0398105
1031	3.0132587	1064	3.0269416	1097	3.0402066
1032	3.0136797	1065	3.0273496	1098	3.0406023
1033	3.0141003	1066	3.0277572	1099	3.0409977
1034	3.0145205	1067	3.0281644	1100	3.0413927

Num	Logarithm	Num	Logarithm	Num	Logarithm
1101	3.0417873	1134	3.0546130	1167	3.0670708
1102	3.0421816	1135	3.0549958	1168	3.0674428
1103	3.0425755	1136	3.0553783	1169	3.0678145
1104	3.0429691	1137	3.0557604	1170	3.0681859
1105	3.0433623	1138	3.0561423	1171	3.0685569
1106	3.0437551	1139	3.0565237	1172	3.0689276
1107	3.0441476	1140	3.0569048	1173	3.0692980
1108	3.0445398	1141	3.0572856	1174	3.0696681
1109	3.0449315	1142	3.0576661	1175	3.0700379
1110	3.0453230	1143	3.0580462	1176	3.0704073
1111	3.0457140	1144	3.0584260	1177	3.0707765
1112	3.0461048	1145	3.0588055	1178	3.0711453
1113	3.0464952	1146	3.0591846	1179	3.0715138
1114	3.0468852	1147	3.0595634	1180	3.0718820
1115	3.0472749	1148	3.0599419	1181	3.0722499
1116	3.0476642	1149	3.0603200	1182	3.0726175
1117	3.0480532	1150	3.0606978	1183	3.0729847
1118	3.0484418	1151	3.0610753	1184	3.0733517
1119	3.0488301	1152	3.0614525	1185	3.0737183
1120	3.0492180	1153	3.0618293	1186	3.0740847
1121	3.0496056	1154	3.0622058	1187	3.0744507
1122	3.0499928	1155	3.0625820	1188	3.0748164
1123	3.0503797	1156	3.0629578	1189	3.0751818
1124	3.0507663	1157	3.0633334	1190	3.0755470
1125	3.0511525	1158	3.0637085	1191	3.0759118
1126	3.0515384	1159	3.0640834	1192	3.0762762
1127	3.0519239	1160	3.0644580	1193	3.0766404
1128	3.0523091	1161	3.0648322	1194	3.0770043
1129	3.0526939	1162	3.0652061	1195	3.0773679
1130	3.0530784	1163	3.0655797	1196	3.0777312
1131	3.0534626	1164	3.0659530	1197	3.0780941
1132	3.0538464	1165	3.0663259	1198	3.0784568
1133	3.0542299	1166	3.0666985	1199	3.0788192
1134	3.0546130	1167	3.0670708	1200	3.0791812

Num	Logarithm	Num	Logarithm	Num	Logarithm
1201	3.0795430	1234	3.0913151	1267	3.1027766
1202	3.0799045	1235	3.0916669	1268	3.1031192
1203	3.0802656	1236	3.0920185	1269	3.1034616
1204	3.0806265	1237	3.0923697	1270	3.1038037
1205	3.0809870	1238	3.0927206	1271	3.1041455
1206	3.0813473	1239	3.0930713	1272	3.1044871
1207	3.0817073	1240	3.0934217	1273	3.1048284
1208	3.0820669	1241	3.0937718	1274	3.1051694
1209	3.0824263	1242	3.0941216	1275	3.1055102
1210	3.0827854	1243	3.0944711	1276	3.1058507
1211	3.0831441	1244	3.0948204	1277	3.1061909
1212	3.0835026	1245	3.0951693	1278	3.1065308
1213	3.0838608	1246	3.0955180	1279	3.1068705
1214	3.0842187	1247	3.0958664	1280	3.1072100
1215	3.0845763	1248	3.0962146	1281	3.1075491
1216	3.0849336	1249	3.0965624	1282	3.1078880
1217	3.0852906	1250	3.0969100	1283	3.1082266
1218	3.0856473	1251	3.0972573	1284	3.1085650
1219	3.0860037	1252	3.0976043	1285	3.1089031
1220	3.0863598	1253	3.0979511	1286	3.1092410
1221	3.0867156	1254	3.0982975	1287	3.1095785
1222	3.0870712	1255	3.0986437	1288	3.1099159
1223	3.0874264	1256	3.0989896	1289	3.1102529
1224	3.0877814	1257	3.0993353	1290	3.1105897
1225	3.0881361	1258	3.0996806	1291	3.1109262
1226	3.0884905	1259	3.1000257	1292	3.1112625
1227	3.0888446	1260	3.1003705	1293	3.1115985
1228	3.0891984	1261	3.1007151	1294	3.1119343
1229	3.0895519	1262	3.1010593	1295	3.1122698
1230	3.0899051	1263	3.1014033	1296	3.1126050
1231	3.0902580	1264	3.1017471	1297	3.1129400
1232	3.0906107	1265	3.1020905	1298	3.1132747
1233	3.0909631	1266	3.1024337	1299	3.1136091
1234	3.0913151	1267	3.1027766	1300	3.1139433

Num	Logarithm	Num	Logarithm	Num	Logarithm
1301	3.1142773	1334	3.1251558	1367	3.1357685
1302	3.1146110	1335	3.1254813	1368	3.1360861
1303	3.1149444	1336	3.1258064	1369	3.1364034
1304	3.1152776	1337	3.1261314	1370	3.1367206
1305	3.1156105	1338	3.1264561	1371	3.1370374
1306	3.1159432	1339	3.1267806	1372	3.1373541
1307	3.1162756	1340	3.1271048	1373	3.1376705
1308	3.1166077	1341	3.1274288	1374	3.1379867
1309	3.1169396	1342	3.1277525	1375	3.1383027
1310	3.1172713	1343	3.1280760	1376	3.1386184
1311	3.1176027	1344	3.1283993	1377	3.1389339
1312	3.1179338	1345	3.1287223	1378	3.1392492
1313	3.1182647	1346	3.1290450	1379	3.1395643
1314	3.1185954	1347	3.1293676	1380	3.1398791
1315	3.1189257	1348	3.1296899	1381	3.1401937
1316	3.1192559	1349	3.1300119	1382	3.1405080
1317	3.1195858	1350	3.1303338	1383	3.1408222
1318	3.1199154	1351	3.1306553	1384	3.1411361
1319	3.1202448	1352	3.1309767	1385	3.1414498
1320	3.1205739	1353	3.1312978	1386	3.1417632
1321	3.1209028	1354	3.1316187	1387	3.1420765
1322	3.1212314	1355	3.1319393	1388	3.1423895
1323	3.1215598	1356	3.1322597	1389	3.1427022
1324	3.1218880	1357	3.1325798	1390	3.1430148
1325	3.1222159	1358	3.1328998	1391	3.1433271
1326	3.1225435	1359	3.1332195	1392	3.1436392
1327	3.1228709	1360	3.1335389	1393	3.1439511
1328	3.1231981	1361	3.1338581	1394	3.1442628
1329	3.1235250	1362	3.1341771	1395	3.1445742
1330	3.1238516	1363	3.1344958	1396	3.1448854
1331	3.1241780	1364	3.1348144	1397	3.1451964
1332	3.1245042	1365	3.1351326	1398	3.1455072
1333	3.1248301	1366	3.1354507	1399	3.1458177
1334	3.1251558	1367	3.1357685	1400	3.1461280

Num	Logarithm	Num	Logarithm	Num	Logarithm
1401	3.1464381	1434	3.1565491	1467	3.1664301
1402	3.1467480	1435	3.1568519	1468	3.1667260
1403	3.1470577	1436	3.1571544	1469	3.1670218
1404	3.1473671	1437	3.1574568	1470	3.1673173
1405	3.1476763	1438	3.1577589	1471	3.1676127
1406	3.1479853	1439	3.1580608	1472	3.1679078
1407	3.1482941	1440	3.1583625	1473	3.1682027
1408	3.1486026	1441	3.1586640	1474	3.1684975
1409	3.1489110	1442	3.1589653	1475	3.1687920
1410	3.1492191	1443	3.1592663	1476	3.1690863
1411	3.1495270	1444	3.1595672	1477	3.1693805
1412	3.1498347	1445	3.1598678	1478	3.1696744
1413	3.1501422	1446	3.1601683	1479	3.1699682
1414	3.1504494	1447	3.1604685	1480	3.1702617
1415	3.1507564	1448	3.1607686	1481	3.1705550
1416	3.1510632	1449	3.1610684	1482	3.1708482
1417	3.1513698	1450	3.1613680	1483	3.1711411
1418	3.1516762	1451	3.1616674	1484	3.1714339
1419	3.1519824	1452	3.1619666	1485	3.1717264
1420	3.1522883	1453	3.1622656	1486	3.1720188
1421	3.1525941	1454	3.1625644	1487	3.1723110
1422	3.1528996	1455	3.1628630	1488	3.1726029
1423	3.1532049	1456	3.1631614	1489	3.1728947
1424	3.1535100	1457	3.1634595	1490	3.1731863
1425	3.1538149	1458	3.1637575	1491	3.1734776
1426	3.1541195	1459	3.1640553	1492	3.1737688
1427	3.1544240	1460	3.1643528	1493	3.1740598
1428	3.1547282	1461	3.1646502	1494	3.1743506
1429	3.1550322	1462	3.1649474	1495	3.1746412
1430	3.1553360	1463	3.1652443	1496	3.1749316
1431	3.1556396	1464	3.1655411	1497	3.1752218
1432	3.1559430	1465	3.1658376	1498	3.1755118
1433	3.1562462	1466	3.1661340	1499	3.1758016
1434	3.1565491	1467	3.1664301	1500	3.1760913

Num	Logarithm	Num	Logarithm	Num	Logarithm
1501	3.1763807	1534	3.1858253	1567	3.1950690
1502	3.1766699	1535	3.1861084	1568	3.1953460
1503	3.1769590	1536	3.1863912	1569	3.1956229
1504	3.1772478	1537	3.1866739	1570	3.1958996
1505	3.1775365	1538	3.1869563	1571	3.1961762
1506	3.1778250	1539	3.1872386	1572	3.1964525
1507	3.1781132	1540	3.1875207	1573	3.1967287
1508	3.1784013	1541	3.1878026	1574	3.1970047
1509	3.1786892	1542	3.1880844	1575	3.1972806
1510	3.1789769	1543	3.1883659	1576	3.1975562
1511	3.1792645	1544	3.1886473	1577	3.1978317
1512	3.1795518	1545	3.1889285	1578	3.1981070
1513	3.1798389	1546	3.1892095	1579	3.1983821
1514	3.1801259	1547	3.1894903	1580	3.1986571
1515	3.1804126	1548	3.1897709	1581	3.1989319
1516	3.1806992	1549	3.1900514	1582	3.1992065
1517	3.1809856	1550	3.1903317	1583	3.1994809
1518	3.1812718	1551	3.1906118	1584	3.1997552
1519	3.1815578	1552	3.1908917	1585	3.2000293
1520	3.1818436	1553	3.1911714	1586	3.2003032
1521	3.1821292	1554	3.1914510	1587	3.2005769
1522	3.1824146	1555	3.1917304	1588	3.2008505
1523	3.1826999	1556	3.1920096	1589	3.2011239
1524	3.1829850	1557	3.1922886	1590	3.2013971
1525	3.1832698	1558	3.1925674	1591	3.2016702
1526	3.1835545	1559	3.1928461	1592	3.2019431
1527	3.1838390	1560	3.1931246	1593	3.2022158
1528	3.1841233	1561	3.1934029	1594	3.2024883
1529	3.1844075	1562	3.1936810	1595	3.2027607
1530	3.1846914	1563	3.1939590	1596	3.2030329
1531	3.1849752	1564	3.1942367	1597	3.2033049
1532	3.1852588	1565	3.1945143	1598	3.2035768
1533	3.1855421	1566	3.1947917	1599	3.2038485
1534	3.1858253	1567	3.1950690	1600	3.2041200

Num	Logarithm	Num	Logarithm	Num	Logarithm
1601	3.2043913	1634	3.2132521	1667	3.2219356
1602	3.2046625	1635	3.2135178	1668	3.2221960
1603	3.2049335	1636	3.2137833	1669	3.2224563
1604	3.2052044	1637	3.2140487	1670	3.2227165
1605	3.2054750	1638	3.2143139	1671	3.2229764
1606	3.2057455	1639	3.2145789	1672	3.2232363
1607	3.2060159	1640	3.2148438	1673	3.2234959
1608	3.2062860	1641	3.2151086	1674	3.2237555
1609	3.2065560	1642	3.2153732	1675	3.2240148
1610	3.2068259	1643	3.2156376	1676	3.2242740
1611	3.2070955	1644	3.2159018	1677	3.2245331
1612	3.2073650	1645	3.2161659	1678	3.2247920
1613	3.2076344	1646	3.2164298	1679	3.2250507
1614	3.2079035	1647	3.2166936	1680	3.2253093
1615	3.2081725	1648	3.2169572	1681	3.2255677
1616	3.2084414	1649	3.2172206	1682	3.2258260
1617	3.2087100	1650	3.2174839	1683	3.2260841
1618	3.2089785	1651	3.2177471	1684	3.2263421
1619	3.2092468	1652	3.2180100	1685	3.2265999
1620	3.2095150	1653	3.2182728	1686	3.2268576
1621	3.2097830	1654	3.2185355	1687	3.2271151
1622	3.2100508	1655	3.2187980	1688	3.2273724
1623	3.2103185	1656	3.2190603	1689	3.2276296
1624	3.2105860	1657	3.2193225	1690	3.2278867
1625	3.2108534	1658	3.2195845	1691	3.2281436
1626	3.2111205	1659	3.2198464	1692	3.2284004
1627	3.2113876	1660	3.2201081	1693	3.2286570
1628	3.2116544	1661	3.2203696	1694	3.2289134
1629	3.2119211	1662	3.2206310	1695	3.2291697
1630	3.2121876	1663	3.2208922	1696	3.2294258
1631	3.2124540	1664	3.2211533	1697	3.2296818
1632	3.2127201	1665	3.2214142	1698	3.2299377
1633	3.2129862	1666	3.2216750	1699	3.2301934
1634	3.2132521	1667	3.2219356	1700	3.2304489

Num	Logarithm	Num	Logarithm	Num	Logarithm
1701	3.2307043	1734	3.2390491	1767	3.2472365
1702	3.2309596	1735	3.2392995	1768	3.2474823
1703	3.2312146	1736	3.2395497	1769	3.2477278
1704	3.2314696	1737	3.2397998	1770	3.2479733
1705	3.2317244	1738	3.2400498	1771	3.2482186
1706	3.2319790	1739	3.2402996	1772	3.2484637
1707	3.2322335	1740	3.2405492	1773	3.2487087
1708	3.2324879	1741	3.2407988	1774	3.2489536
1709	3.2327421	1742	3.2410481	1775	3.2491984
1710	3.2329961	1743	3.2412974	1776	3.2494430
1711	3.2332500	1744	3.2415465	1777	3.2496874
1712	3.2335038	1745	3.2417954	1778	3.2499318
1713	3.2337574	1746	3.2420442	1779	3.2501759
1714	3.2340108	1747	3.2422929	1780	3.2504200
1715	3.2342641	1748	3.2425414	1781	3.2506639
1716	3.2345173	1749	3.2427898	1782	3.2509077
1717	3.2347703	1750	3.2430380	1783	3.2511513
1718	3.2350232	1751	3.2432861	1784	3.2513948
1719	3.2352759	1752	3.2435341	1785	3.2516382
1720	3.2355284	1753	3.2437819	1786	3.2518815
1721	3.2357809	1754	3.2440296	1787	3.2521246
1722	3.2360331	1755	3.2442771	1788	3.2523675
1723	3.2362853	1756	3.2445245	1789	3.2526103
1724	3.2365373	1757	3.2447718	1790	3.2528530
1725	3.2367891	1758	3.2450189	1791	3.2530956
1726	3.2370408	1759	3.2452658	1792	3.2533380
1727	3.2372923	1760	3.2455127	1793	3.2535803
1728	3.2375437	1761	3.2457594	1794	3.2538224
1729	3.2377950	1762	3.2460059	1795	3.2540645
1730	3.2380461	1763	3.2462523	1796	3.2543063
1731	3.2382971	1764	3.2464986	1797	3.2545481
1732	3.2385479	1765	3.2467447	1798	3.2547897
1733	3.2387986	1766	3.2469907	1799	3.2550312
1734	3.2390491	1767	3.2472365	1800	3.2552725

1800

Num	Logarithm	Num	Logarithm	Num	Logarithm
1801	3.2555137	1834	3.2633993	1867	3.2711443
1802	3.2557548	1835	3.2636361	1868	3.2713769
1803	3.2559957	1836	3.2638727	1869	3.2716093
1804	3.2562365	1837	3.2641092	1870	3.2718416
1805	3.2564772	1838	3.2643455	1871	3.2720738
1806	3.2567177	1839	3.2645817	1872	3.2723058
1807	3.2569582	1840	3.2648178	1873	3.2725378
1808	3.2571984	1841	3.2650538	1874	3.2727696
1809	3.2574386	1842	3.2652896	1875	3.2730013
1810	3.2576786	1843	3.2655253	1876	3.2732328
1811	3.2579184	1844	3.2657609	1877	3.2734643
1812	3.2581582	1845	3.2659964	1878	3.2736956
1813	3.2583978	1846	3.2662317	1879	3.2739268
1814	3.2586373	1847	3.2664669	1880	3.2741578
1815	3.2588766	1848	3.2667020	1881	3.2743888
1816	3.2591158	1849	3.2669369	1882	3.2746196
1817	3.2593549	1850	3.2671717	1883	3.2748503
1818	3.2595939	1851	3.2674064	1884	3.2750809
1819	3.2598327	1852	3.2676410	1885	3.2753113
1820	3.2600714	1853	3.2678754	1886	3.2755417
1821	3.2603099	1854	3.2681097	1887	3.2757719
1822	3.2605484	1855	3.2683439	1888	3.2760020
1823	3.2607867	1856	3.2685780	1889	3.2762320
1824	3.2610248	1857	3.2688119	1890	3.2764618
1825	3.2612629	1858	3.2690457	1891	3.2766915
1826	3.2615008	1859	3.2692794	1892	3.2769211
1827	3.2617385	1860	3.2695129	1893	3.2771506
1828	3.2619762	1861	3.2697464	1894	3.2773800
1829	3.2622137	1862	3.2699797	1895	3.2776092
1830	3.2624511	1863	3.2702128	1896	3.2778383
1831	3.2626883	1864	3.2704459	1897	3.2780673
1832	3.2629255	1865	3.2706788	1898	3.2782962
1833	3.2631625	1866	3.2709116	1899	3.2785250
1834	3.2633993	1867	3.2711443	1900	3.2787536

1900

1900

Num	Logarithm	Num	Logarithm	Num	Logarithm
1901	3.2789821	1934	3.2864565	1967	3.2938044
1902	3.2792105	1935	3.2866810	1968	3.2940251
1903	3.2794388	1936	3.2869054	1969	3.2942457
1904	3.2796669	1937	3.2871296	1970	3.2944662
1905	3.2798950	1938	3.2873538	1971	3.2946866
1906	3.2801229	1939	3.2875778	1972	3.2949069
1907	3.2803507	1940	3.2878017	1973	3.2951271
1908	3.2805784	1941	3.2880255	1974	3.2953471
1909	3.2808059	1942	3.2882492	1975	3.2955671
1910	3.2810334	1943	3.2884728	1976	3.2957869
1911	3.2812607	1944	3.2886963	1977	3.2960067
1912	3.2814879	1945	3.2889196	1978	3.2962263
1913	3.2817150	1946	3.2891428	1979	3.2964458
1914	3.2819419	1947	3.2893659	1980	3.2966652
1915	3.2821688	1948	3.2895889	1981	3.2968845
1916	3.2823955	1949	3.2898118	1982	3.2971036
1917	3.2826221	1950	3.2900346	1983	3.2973227
1918	3.2828486	1951	3.2902573	1984	3.2975417
1919	3.2830750	1952	3.2904798	1985	3.2977605
1920	3.2833012	1953	3.2907022	1986	3.2979792
1921	3.2835274	1954	3.2909246	1987	3.2981979
1922	3.2837534	1955	3.2911468	1988	3.2984164
1923	3.2839793	1956	3.2913688	1989	3.2986348
1924	3.2842051	1957	3.2915908	1990	3.2988531
1925	3.2844307	1958	3.2918127	1991	3.2990713
1926	3.2846563	1959	3.2920344	1992	3.2992893
1927	3.2848817	1960	3.2922561	1993	3.2995073
1928	3.2851070	1961	3.2924776	1994	3.2997251
1929	3.2853322	1962	3.2926990	1995	3.2999429
1930	3.2855573	1963	3.2929203	1996	3.3001605
1931	3.2857823	1964	3.2931415	1997	3.3003781
1932	3.2860071	1965	3.2933626	1998	3.3005955
1933	3.2862318	1966	3.2935835	1999	3.3008128
1934	3.2864565	1967	3.2938044	2000	3.3010300

AN
APPENDIX,
CONTAINING
The Use of the *Fore-Staff*,
Quadrant & *Nocturnal*
IN
NAVIGATION.

*The Description and Use of the Fore-Staff or
Cross-Staff.*

THE *Fore-Staff* consists of a *Staff* and *four Crosses*; usually the shortest is called the *ten Cross*, and belongs to that side of the *Staff* where the *Divisions* begin at about 3 degrees and end at 10 degrees, and is called the *ten Side*, the next longer is called the *30 Cross*, and belongs to that Side where the *Divisions* begin, at 10 deg. and end at 30, and this is called the *30 Side*. The next longer is called the *60 Cross*, and belongs to that Side where the *Divisions* begin at 30 d. and end at 60, and is called the *60 Side*. The longest *Cross* is called the *90 Cross*, and belongs to that Side where the *Division* begins at 30 deg. and end at 90, and is called the *90 Side* of the *Staff*.

The Use of the Fore-staff.



The Use of this Cross-Staff is to observe the Meridian Altitude of the Sun or Stars, and the 10, 30, 60, and 90 Crosses are to be used according as the *Meridian Altitude* is greater or less, that is, if it be less than 10 deg. use the 10 Cross, if less than 30 deg. the 30 Cross, if less than 60 deg. the 60 Cross; but if greater the 90 Cross.

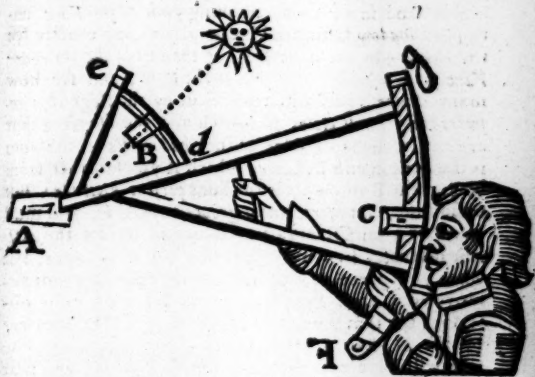
The manner to hold the Staff in time of Observation is thus, place the flat end of the Staff to the outside of your eye, as near as you can, not to hinder your sight, and look at the *upper end* of the Cross for the Sun or Star, and at the *lower end* for the Horizon; but if you see the *Sky* instead of the *Horizon*, draw the Cross a little nearer your eye, but if you see the *Sea* instead of the *Horizon*, put the Cross a little farther from your eye, and so continue removing the Cross, until you see exactly the Sun or Star by the *top* of the Cross and the Horizon by the *lower end* thereof. The *Deg. and Min.* cut by the *inner Edge* of the Cross, upon the side of the Staff peculiar to the Cross you use, is the present *Altitude* of the Sun or Star, but it being the *Meridian* or *greatest Altitude* which you are to find, you must

The Use of the Quadrant.

must continue your Observation as long as you find the *Altitude increase*, still drawing the Cross nearer to your eye, but when you perceive the *Altitude is diminished*, desist your Observation, and do not alter your Cross to remove it backward from your Eye, but as the Cross stands, count the *Deg. and Min.* on the Side proper to the Cross, which gives the *Meridian Altitude* required, and the Meridian Altitude subtracted from 90 deg. 00 min. gives the *Zenith Distance*.

And hence to find the Latitude of the Place of Observation, shall be shewn after the Use of the Quadrant.

The Description and Use of the Sea-Quadrant.



THIS Instrument is very convenient for to take the *Suns Altitude* at Sea, it consists of *three Vanes* and *two Arches*, they are called the *Horizon Vane* at A, the *Shadow-Vane* at B, the *Sight Vane* at C, the

The Use of the Quadrant.

60 Arch *d e*, and the 30 Arch *F g*. The 60 Arch is divided into 60 deg. by every 5 and sometimes by every single Degree, the 30 Arch is divided to every degree and 10 min. and also into 1 or 3 min. by Diagonal Lines.

To observe with this Instrument you must look through the *small Hole in the Sight-Vane*, and so raise or depress your *Quadrant*, until the *Shadow of the upper Edge of the Shadow-Vane* fall upon the *upper Edge of the Slit in the Horizon-Vane*, and at the same time look through the *Slit in the Horizon-Vane*, that the *upper Edge of the Slit* may cut the *Horizon*; but if instead of the *Horizon* you see the *Water*, then remove your *Sight-Vane* a little lower, but if instead of the *Horizon* you see the *Sky*, then remove your *Sight Vane* a little higher, and so continue removing your *Sight-Vane*, until (the *Shadow* falling in his due place) you exactly see the *Horizon* by the *upper Edge of the Slit in the Horizon-Vane*; then look upon the *Sight Vane*, and see how many Degrees and Minutes are cut by the *Edge that answers to the small Hole*, to which add the Degrees that are cut by the *upper Edge of the Shadow-Vane*, the Sum is the *Suns Zenith Distance*, which if you subtract from 90 deg. the Remainder is the *Suns present Altitude*: But to find the *Suns Meridian or greatest Altitude*, you must continue your Observation as long as you see the *Altitude* increase, by removing your *Sight-Vane* lower, but when you perceive the *Altitude* to lessen, do not remove your *Sight-Vane* higher, but leave off your observing for that time, and counting your Degrees cut by the *Shadows Sight-Vanes* as before directed, the Sum will give you the *Suns Zenith Distance*, and that subtracted from 90 deg. gives the *Suns Meridian Altitude*.

Rules

The Use of the Quadrant.

Rules to find the Latitude of a Place by Observation of the Suns Meridian Altitude.

YOU must first find the Suns Zenith Distance by the Cross-Staff or Quadrant, as you was directed, and then find the Suns Declination for the day you observe in by the Table of the Suns Declination aforegoing, and thereby you may find the Latitude of the Place by the following Rules.

Rules for North Latitude.

I. IF the Suns Declination be Southerly, subtract the Declination from the Zenith Distance, the Remainder is the Latitude of the Place.

Example.

October 10, 1674. the Suns Zenith Distance is 59 d. 06 m. and the Suns Declination 10 d. 33 m. South; to find the Latitude of the Place.

The Zenith Distance	59 d. 06 m.
The Declination subtracted	10 33
The Latitude is	48 33

II. If the Suns Declination be Northerly, add the Suns Declination to the Zenith Distance, the Sum is the Latitude of the Place, but if the Declination be greater than the Zenith Distance and the Sun be due North at noon, then subtract the Zenith Distance from the Declination, the Remainder is the Latitude; but in all other cases you must add the North Declination to the Zenith Distance.

(1.) Example.

The Use of the Quadrant.

(1.) Example.

July 20, 1675. The Suns Zenith Distance is 38 d. 12 m. and the Suns Declination 18 d. 33 m. North, to find the Latitude of the Place,

The Zenith Distance	38 d. 12 m.
The Declination added	18 33
The Latitude	<hr/> 56 45

(2.) Example.

June 29, 1676. The Suns Zenith is 12 d. 42 m. and the Declination 22 d. 19 m. North, to find the Latitude of the Place.

The Declination	22 d. 19 m.
The Zenith Distance subtracted	12 42
The Latitude	<hr/> 9 37

Rules for South Latitude.

I. If the Declination be Northerly, subtract the Declination from the Zenith Distance, the Remainder is the Latitude of the Place.

Example.

August 14, 1677. The Suns Zenith Distance is 38 d. 17 m. and the Declination 10 d. 56 m. North, to find the Latitude of the Place.

The Zenith Distance	38 d. 17 m.
The Declination subtracted	10 56
The Latitude	<hr/> 27 21

II. If the Declination be Southerly, add the Declination to the Zenith Distance, the Sum is the Latitude of the Place, but if the Declination be greater than the Zenith Distance, and the Sun be due South at noon, then subtract the Zenith Distance from the Declination, the Remainder is the Latitude; but in all other cases except this, you must add the South Declination to the Zenith Distance.

I. Exam-

The Use of the Quadrant.

(1.) Example.

December 22, 1678. The Suns Zenith Distance is 12 d. 37 m. and the Suns Declination 23 d. 01 m. South, to find the Latitude of the Place.

The Zenith Distance	12 d. 37 m.
The Declination	23 01
The Latitude	<hr/> 35 38

(2.) Example.

December 22, 1678. The Suns Zenith Distance is 12 d. 37 m. the Declination 23 d. 01 m. South, the Sun being due South at noon, to find the Latitude of the Place.

The Declination	23 d. 01 m.
The Zenith Distance subtracted	12 37
The Latitude	<hr/> 10 24

Note 1. That if the Sun have no Declination, the Zenith Distance is the Latitude of the Place, and if the Sun be due North at noon, the Latitude is Northerly ; if South at noon, it is South Latitude.

Note 2. That if the Sun be in your Zenith, then the Suns Declination is the Latitude of the Place, and if the Declination be Southerly, your Latitude is Southerly ; but if the Declination be Northerly, then your Latitude is Northerly.

Note 3. That if you observe any of the fixed Stars upon the same side of the Meridian, as you observe the Sun at noon, the Rules are the same for the Stars as for the Sun before delivered.

The

The Description and Use of the Nocturnal.

THIS Instrument consists of three parts: The first or Handle part hath on it two Circles divided, the outmost is the Ecliptick, divided into 12 equal parts, in which is put the 12 Signs, and each of those divided into 30 equal parts or degrees. The inward Circle is the 12 Months, each Month divided into its respective Days: The middle Rundle hath a Tooth to be turned to the Day of the Month, and is divided into 24 Hours, and within that a Circle divided into 32 equal parts or Points of the Mariners Compass: The upper part is the Index having one Side proceeding from the Center to be turned to the Guards in time of Observation. Through all these Pieces in the Center of the Instrument is a Hole, through which you are to see the North-Star, and at the same time the Index to be turned to the Guards.

Place the Tooth or Index of the middle Circle to the day of the Moneth, and it will cut in the outward Circle the Suns Place in the Ecliptick; then hold the Instrument on high a little distance from you as upright as you can with the fore-side towards you, looking through the Hole of the Center until you may see the North-Star. Then turn the long Index or Pointer upwards or downwards till you see the brightest of the Guards on the little Bear by the edge of the Rule, and you will find upon the second Circle the edge of the Rule or Index will cut the Hour of the Night. At the same time you will find on the backside what Point of the Compass the Guards are upon, so that you may know also what Declination the North-Star hath at that time either above or under the Pole.

F I N I S.

rift
ed,
nal
ose
ard
its
oth
led
ato
ls :
ed-
in
the
ich
me

e to
ard
old
up-
ing
the
nter
the
and
the
the
ut of
may
at